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M. Deprez's Discovery.

POWER TRANSMITTED BY ELECTRICITY OVER AN ORDINARY IRON WIRE—ONLY FIFTY PER CENT. OF LOSS—THE SUCCESS OF THE RECENT EXPERIMENTS—WHAT IS LIKELY TO COME OF THEM—PROF. SIEMENS' PROGNOSTICATION ABOUT NIAGARA LOOKING LESS AND LESS CHIMERICAL.

The electrical transmission of power from points where it is cheap, as at the coal mines or on the banks of a running stream, to distant parts where its generation is costly, is a problem whose solution has long been sought. Only a few years ago Prof. C. W. Siemens, of the Royal Society of Great Britain, read a paper upon the subject before the Glasgow University wherein he made predictions of the ultimate sucess of the project which, had they come from a less reliable source, would have been regarded as preposterous. As it was, the scientific censors on both sides of the ocean were inclined to look incredulous when the scheme was referred to, and not having the temerity to laugh outright, contented themselves with characterizing it as the dream of a scientific enthusiast.

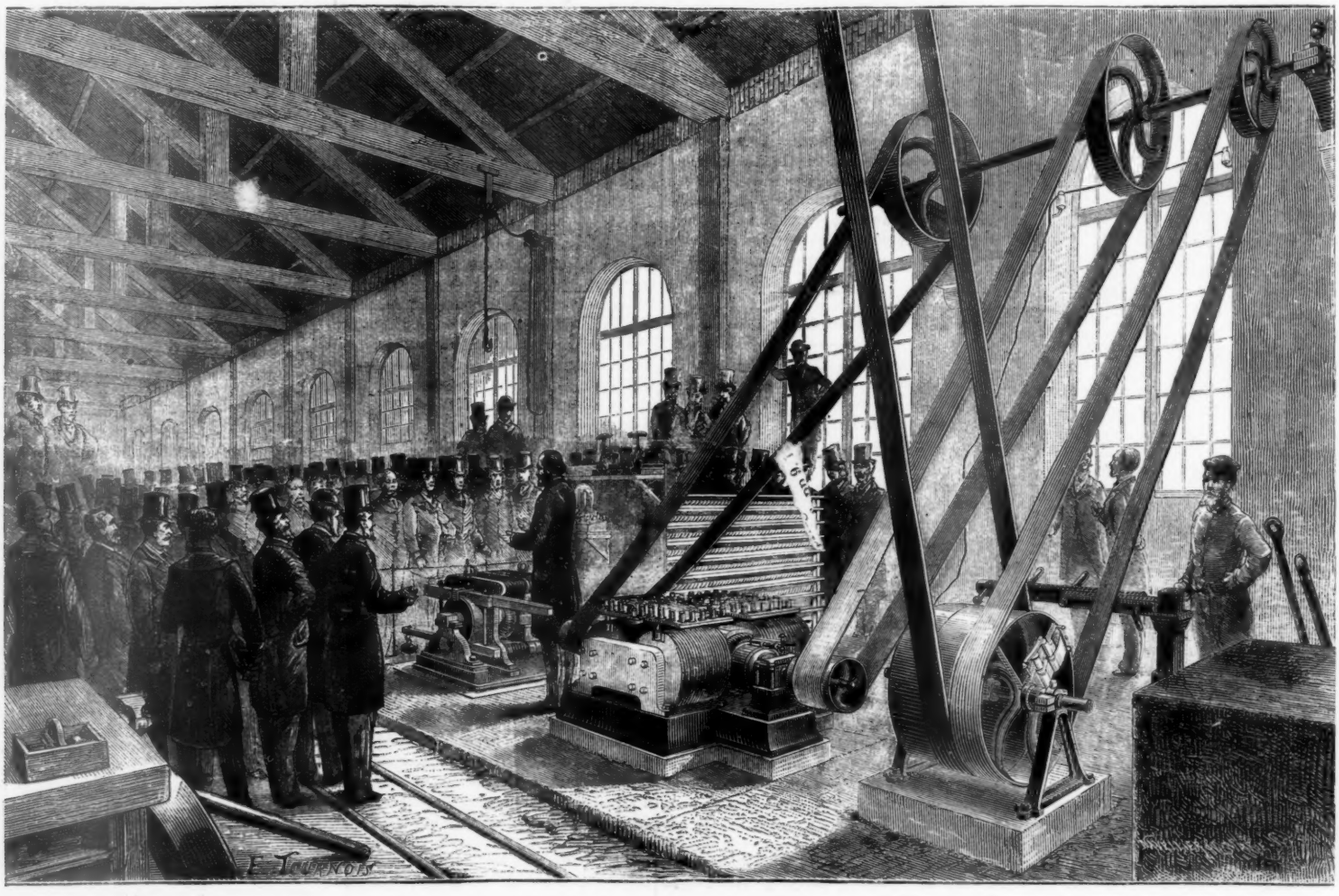
But have not all the great scientific schemes been so regarded at their inception? Was it not so with the earlier applications of steam, of the use of the paddle-wheel for propulsion, of its successor, the propeller, of the application of electricity to telegraphy, of the forcing of gas through pipes by pressure, and a host of others? There would seem to be a factor in the make-up of the average scientist which leads him to doubt the feasibility of all schemes not devised in his own laboratory. Learned scientists have from time to time applied themselves to transmitting power to a distance, and we have at hand their estimates of the diameter of the copper wire which would be required at various distances from the source of power, and the losses, or, more practically speaking, the leakages of the electricity *en route*.

According to these estimates, when but a few miles had been traversed the diameter of the copper wire had multiplied itself many times, and, at the ruling price of copper, the interest on its cost price would prove greatly in excess of the sum that could reasonably be demanded for the power transmitted over it, and the amount of power recovered at the second machine so small a percentage of that with which the wire had been originally charged at the source, as to be practically of but slight, if any, advantage for ordinary usage.

As was demonstrated some time since, the learned scientific gentlemen already referred to are apt to work in grooves. That is to say, they make up their minds that a certain thing for which they are in search is to be found only by keeping strictly within the limits of certain well-known physical laws. While they are still methodically and laboriously plodding along, some man with but a tithe of their learning, but far more ingenuity and enterprise, reaches the goal by means of devices of such simplicity as to have never been dreamt of in their philosophy.

Such is the discovery by M. Deprez, of a means of transmitting power to a distance by means of electricity. [See illustration.] He does not use copper at all in his wires, but sends the gathered power by means of electricity from point to point over ordinary iron wires.

Before a large number of scientific men, M. Deprez recently tested his discovery in the machine shops of the *Chemin de fer du Nord*. The experiments which it was proposed to make were the transmission of six horse-power over a line of 20 kilometers *v a* Bourget, and of ten horse-power over a line of 35 kilometers *via* Sevran-Livry. In each case, it is alleged, the results proved to be as claimed by the inventor, viz., 50 per cent. of the force generated was rendered to the receiver—that is to say, the six horse-power sent by way of Bourget was found at the terminus of the line to give three horse-power; the ten horse-power, by way of Sevran-Livry, to give five horse-power.



TRANSMISSION OF MOTIVE POWER TO GREAT DISTANCES BY ORDINARY TELEGRAPH WIRE.

Estimating a kilometer to be 1093.633 English yards, we thus have three horse-power transmitted about 12½ miles, and five horse-power transmitted 21¼ miles, and the most astonishing part of the experiments, if they have been faithfully described is, that the loss while *in transitu* was the same in each case.

The amount of electricity taken off at any one point might be readily regulated in the same manner as the current taken from a battery for telegraphic purposes is now regulated—that is, by introducing suitable resistance in the local line.

We do not wish to be understood as say-

ing that the results, as given, of these experiments in the *Chemin de fer du Nord* are satisfactory, or that they furnish sufficient evidence of the accomplishment of that which their author undertook. On the contrary, the methods employed in collecting the results are open to severe criticism. By these methods, the leakage which takes place on a line of telegraph wire used in transmitting power from a distance mislead the public into the belief that a greater mechanical return has been made than was in fact the case. Thus at the transmitting point a given horse-power indicates in the receiver a return of fifty per cent. through a wire of a resistant force of 160 ohms and say 20 kilometers, while in reality the leakage on the line will be found to reduce this resistance, and therefore its equivalent length in actual practice. Therefore, while the machines are connected as were those in question, it would be incorrect to say that the return was obtained through an actual length of 20 kilometers, or through a resistance of 160 ohms.

The date of these experiments is thus furnished by M. Deprez himself in *La Lumiere Electrique:*

Resistance of the telegraph wire.....160 ohms.

Generator.

Resistance of the inductors.. 20 ohms.
" " bobbins... 36 ohms.
Number of revolutions per minute.....650
Intensity of the current.....2.1 ampéres.

Receiver.

Resistance of the inductors.. 50 ohms.
" " bobbins... 32 ohms.
Number of revolutions per minute.....313
Resistance of the total circuit.299 ohms.
Useful work measured on the brake per second.... } 156 kilogram-meters.

As will be seen, the measurements of the electro-motive force and the mechanical work expended are missing. A writer in *La Lumiere Electrique*, by a series of hypotheses, computes the total mechanical work supplied at 418 kilogrammeters per second, and from this he arrives at the conclusion that the lowest limit of the industrical mechanical return is 37 per cent.

Very thin wire is coiled upon the inductors of the machines used by M. Deprez to insure high tension and but small intensity of current. The form of receiver is similar in many respects to the Gramme machine "C" type. Two large electro-magnets face each other, with their poles of contrary name opposite, at the extremities of which are pole-pieces, semi-circular in form; the four poles of the two electro-magnets leave thus between them two cylindrical spaces wherein a Gramme ring turns. The rings of the two machines and the bobbins of the electro-magnets are connected in series so that the inductors shall be excited by the total current. In several sectional bobbins the inductors are coiled, and upon a board are fixed the ends of the wires from each of these bobbins, attached to terminals. By this plan, the number of acting bobbins may be readily changed.

M. Deprez gives his reasons for believing that inductors of this form are superior in efficiency to those in common use. He says: "The lines of force produced in the field by the passage of the current in the bobbins, not being deflected to the polar extremities, are at once more regular, better distributed, and furnish, all other elements being the same, a magnetic field less costly to produce."

The advantage of this discovery of M. Deprez, even if no further successes were scored in the same direction, is incalculable. It opens an immense field to enterprise, and, if the result of the experiments have not been exaggerated, a radical change in the means now employed in disseminating the electric light may be looked for in the not distant future. For if fifty per cent. of the power applied to the first machine may be recovered in the second at a distance of 21½ miles, the problem of the transmission of power is as good as solved. What would a loss of fifty per cent. be when power was being collected from a running stream, a waterfall, a windmill, or even an engine fed with coal-waste fuel at the coal mines?

The assertion of Dr. Siemens regarding the transmission of the power of Niagara does not seem so chimerical in the light of this new discovery. Here it is:

"The amount of water falling over Niagara is equal to 100,000,000 tons an hour, falling 150 feet. The amount of coal required annually to raise such a weight up to the point from which it fell, which is the measure of the amount of power yielded by that water in falling, would require the consumption of 260,000,000 tons of coal a year, which is the amount now consumed by the entire world. Now, if 50 per cent. of the power used to drive the first dynamo electric machine may be recovered from the second; and hence, if the whole power of Niagara could be utilized, it could be distributed over the United States, so as to give from that water-fall alone a power equal to the present entire mechanical force of the world, estimating that one-half the coal used is solely for mechanical purposes."

A portion of the power generated by such a body as the falls of Niagara might, and doubtless will be practically utilized at a more advanced stage of perfection of M. Deprez's system. Let us suppose that a series of flumes were constructed from the edge of the descent of the American falls to the level of the water below of a size sufficient to carry all the water of the Niagara River through water-wheels. With proper shafting this power could be used to turn the machine generating the electric current. This current could then be carried to New York City by conductors. The wires might be tapped at any point *en route* wherever power was needed, and the wires carried into factories just as gas is now carried in by means of pipes. In the factory an electric-moter might be placed of sufficient power to turn the shafting. And thus all the power required to run the innumerable factories and workshops and to supply electricity for lighting could be taken off along the line of the power transmitting wires.

Electricity for Propulsion.

We extract from the N. Y. *Times* the following very interesting remarks upon the subject above referred to:

"Incidents reported from time to time mark progress in the utilization of man's latest acquired servant for performing other tasks than lighting lamps and running on errands. In November last the Faure Electrical Storage and Light Company, of this city, with $2,000,000 capital, filed its certificate of incorporation in Albany, and the like certificate has recently been filed by the Electrical Accumulator Company, of this city, with $5,000,000 capital. Last November the London *Electrician* gave a brief mention of a tricycle successfully driven by electricity, and the machine, in an improved form, was to have been exhibited at the annual Stanley show of bicycles and tricycles, just held in Albert Hall, London; for some reason it was not there, and while its reappearance is awaited we will condense a description of the pioneer machine given by the London *Tricycling Journal* of Dec. 6. The tricycle was an ordinary one of the 'single-driving' pattern, consisting of a 'hay-fork' frame, carrying two equal wheels, with a small steering-wheel at the end of the frame behind, running midway between the others. To the side of one of the large 44-inch wheels was attached a smaller toothed wheel having 248 teeth; this geared with a pinion of 12 teeth, which was connected directly with the motor itself; the motor, therefore, gained power at the expense of speed in the ratio of about twenty to one, the motor-wheel making 1,200 revolutions per minute when a speed of eight miles an hour was attained. The secondary battery was carried on a platform below hung from the frame-work. At the left of the rider was a small horizontal disk, called a commutator, resembling somewhat a switch-board in appearance; by working this with the left hand the cells of the battery were turned on or off at will, and as the full power was attained only by passing through all the intermediate powers, there were no shocks or sudden starts. Borne on rods on either side in a convenient place for reading was an ammeter, for measuring at every moment the main current, and a volometer, for showing the elrctro-motive force between the two terminals; above the ammeter and the volometer were two incandescent lamps of four-candle power each. The brake, on the left, and the rack-and-pinion steering apparatus, on the right, were of the usual pattern. The motor employed by Profs. Ayrton and Perry in this machine weighs 45 pounds. It was the smallest that had been made up to that time, but its power (a half-horse) was unnecessarily large. The battery itself weigs 150 pounds, and contains energy equivalent to two one-horse power hours, or to one-horse power for two hours, or to a half-horse power for four hours. In this experimental machine the treadles were absent, but it is proposed hereafter to retain them as an alternative or auxiliary power.

"The frame of an electrical tricycle (perhaps not the expected one above referred to, was at the Stanley show. According to the *Tricycling Journal* of Jan. 31, the tricycle weighs 90 pounds, the half-horse power motor 25 pounds; and the 'Bunsen's battery' 30 pounds, thus adding only 55 instead of 195 pounds, as in the machine already described. 'The connection is applied by means of copper plates on the pedals, and insulated copper wire is used for the purpose of conveying the electricity; the speed can be regulated by the rider, according to the rapidity with which he cares to work the pedals.' This description is somewhat vague, but it appears to indicate a magneto-electrical machine, to be driven by the rider himself; the practical gain of having him run a dynamo, which should then propel the tricycle, might be questioned, but the suggested reduction of dead weight in the apparatus is at least interesting.

"To the careless reader, who views these articles for self-propulsion as toys, hints of electrical assistance may seem a trifle; but the careless reader is mistaken at the outset. The bicycle is not a mere toy and an instrument for sport and amateur athletics, and the tricycle, which probably has capacity for the wider use and 'business,' is still less so. A vehicle which is spreading into every civilized or half-civilized country is adapted to and used by both sexes, has already displaced the horse in the all-round work of hundreds of clergymen and physicians, has been officially adopted by the British Postal Department as an aid in collections and deliveries, and is working into use at a rate that astonishes even its friends, must be admitted to be past the point of subjection to scoffing and putting down.

"The practical application of electricity as an auxiliary or alternative propelling power is of no inconsiderable importance as respects these carriages; as respects conveyances of burdens it is still more so. Good roads being at once product, proof and condition of the higher civilization, and also a paying investment in the economical view, these modern steel steeds are silently doing a valuable work in road improvement, because the horse, although a much-interested party, has neither voice nor vote on road-making. To turn the horse to grass would, therefore, be so far an aid to road improvement by calling on necessity for invention and energy; besides, the horse is a nuisance, emphatically in cities, tolerated only for lack of a better instrument. The Third avenue surface railroad is considering the San Francisco steam cable system, and the horse will be first (and probably at no distant day) dismissed from his regular work on the car routes, where he does the most mischief and is the least necessary. He came from the plains and belongs there, or, at least, in the open country; but men have caught him, and have built cities around him. To say that he will be returned to what may be called his wilder and natural uses—say carrying us on his back—may seem a bold flight of fancy to one who imagines an ordinary driver starting a stalled truck by an electrical motor and an accumulator, but it is unsafe to set bounds to the applications of invention in progress; the prophecy that a thing will never be done has so often been followed soon by the doing of it that one is tempted to the extravagance of saying that only the impossibilities in modern practical science are impossible."

Electric Storage.

A NEWARK COMPANY IN THE FIELD—CONTESTING THE CLAIMS OF FAURE AND BRUSH.

A company has been formed in this city which is expected to occupy a prominent position in the process of storing electricity for lighting and other purposes. Its patents are now before the Commissioner of Patents at Washington, and if all the claims of the Newark organization are granted the celebrated Frenchman (Faure) and the hardly less famous Brush will lose some of their titles to consideration as discoverers.

The Newark company claims priority in the invention of the true system of storing electricity, of which M. Faure has been said to be the prophet and inventor. The electrician of the company, whose inventions the corporation holds and proposes to operate, is Nathaniel S. Keith, of New York.

The company is named "The American Electric Storage Company," and its directors are Geo. W. Hubbell, Henry Young, Geo. G. Frelinghuysen, Barker Gummere, Jr., and F. T. Fearey.

Mr. Keith claims that two years before Faure secured his French patents he (Keith) had discovered the principles of the storage of electricity, and that to him belong the right of the invention. The patent asked for is not on the principle of electric storage, however, but on the process of constructing the reservoirs. As is known, the great thing desired in electric lighting since its practicability has been demonstrated, has been some system by which the lights were not dependent on every stroke of an engine for continuity. The storage of power, as every master mechanic knows, has been one of the great problems in mechanics, and its necessity was seen at once in electric lighting. If the lamps were only to burn when the engines were working, it was seen that the time would come when the engine might give out and leave every customer without a light, and it was also evident that the engines could not be kept working night and day to supply the demand which exists at all hours. Storage was a necessity.

The Faure, Brush and Keith inventions step in at this point. They provide a box reservoir composed of a series of lead plates into which the electric current is turned. The electricity produces a chemical action on the plates which forms a "potentiality of electric force," which will discharge the electricity in almost the same volume as received. The Keith invention differs from the Faure and Brush principally by the use of pure lead plates in the reservoir, instead of red lead. The pure lead yields much more rapidly to the action of the electric current, and the reservoir may be prepared for use in far less time. The reservoir will discharge 90 per cent. of the electricity it receives, and the inventor claims that the proportion may be made even larger.

The system is now in working order at the company's office, No. 792 Broad street. The storage reservoir is a box eight inches square, in one corner of the room. It is filled with a series of lead plates, and altogether weighs about forty pounds or less. Into this box is conducted a wire from the electric generator in Mechanic street, which supplies the reservoir. The Mechanic street engine runs eight hours a day, and this supplies the reservoir with electricity sufficient to supply incandescent lights for seven hours, provided the lights use up in one hour as much electricity as the generator supplies in the same time. From the box extend wires connecting with beautifully mounted incandescent lamps of both the Weston and Edison make.

The American Company does not intend to go into the lighting business itself, but will sell its licenses to other companies which will apply the process practically.—*Ex.*

The Electric Light at the Eden Theatre, Brussels.

(*Translated from La Lumière Electrique.*)

The progress constantly being accomplished in the construction of apparatus intended for electric lighting renders possible the application of the new method of illumination to all the varied forms of modern industry.

It is very interesting to follow with an attentive eye the movement now going on in the Patent Offices, both in France and abroad, and to notice that not a day passes without some invention, connected with electricity, being registered. Electric lamps hold, as to number, the first place in the list of electric inventions, and while certain types display originality in conception, yet the general movement is in the same well-worn rut, and many so-called inventions brought before the public with a great flourish of advertisement, are often only modifications, more or less valuable, of apparatus already in use, or applications of principles already well-known. However that may be, one is nowadays embarrassed in making a choice between the numerous new systems of electric lighting; and the numerous efforts at improvement in this field, recorded in our columns from day to day, proves how much this interesting question occupies the attention of inventors.

In awaiting a practical system of distribution to be successful in all our commercial and industrial centers, a result which cannot long be delayed after the conclusive experiments made on the lines of the *Chemin de Fer du Nord* for the transport of force to a distance on ordinary telegraph lines by the method of M. Marcel Deprez, there have been made in a great number of cities isolated installations which have demonstrated that electricity must sooner or later replace all other systems of lighting hitherto known, both for public highways and domestic uses. Everyone will recall the experiments in electric lighting made in the beautiful Avenue de L'Opéra, which was then newly opened, at the time of the exhibition in 1878. The experiment was entirely probationary, but was continued during several years, and has only recently ceased by reason of a failure of the understanding between the *Societe Jablochkoff* and the Municipal Council.

The same demonstration has long since been made for large establishments, and in the latter case it is proved that the new illuminant while possessing extraordinary advantages from a hygienic point of view, as well as for the quantity and beauty of the light, realizes also great saving in expense. Buildings like the *Louvre*, which was the first one to enter into the way of progress, are one after another adopting the new methods. We have besides in a preceding article, given an account of installations actually made in certain of the great stores of Paris.

It is principally for theatres and establishments of all descriptions that the electric light ought to be preferred to all other means of illumination, for it presents for these purposes advantages of the first importance. During the ordinary course of the representations the ventilation of the auditorium leaves much to be desired; notwithstanding all the precautions adopted the heat and vitiated air serve to make a trial of endurance of a performance where a numerous audience is present, besides the safety of the spectators is always menaced, and we have only too many examples of the terrible catastrophes produced by gas, not to wish for its replacement by a safer agent, as rapidly as possible.

Among the large installations made in Paris among establishments of this character, every one knows the Hippodrome, beautifully lighted with numerous electric candles, of which the regular working during several years has never caused a disappointment. During the year 1882 an experiment was tried in lighting the *Theatre des Varietes* with the system of simple incandescence; but it seems to us that for a theatre these small lights are insufficient, and can only produce an adequate decorative effect when supplemented by the arc lights.

We are, besides, happy to note all the essays which are being made in this direction everywhere, and that they will be found in great number in foreign cities. Brussels, among others, has not been willing in this respect, to lose its nickname of *Little Paris;* in fact, it is well known that the capital of Belgium possesses already many natural points of comparison. The boulevards, the diminutive park of the Tuileries, the squares, the luxury of its stores, and in the environs of the city the *Alee Vert*, which may be compared to the Champs-Elysees, and, finally, the *Bois de la Chambre* and its lake, recalling the *Bois de Boulogne*, are among the points of resemblance. The extensive demolitions which have been made for the opening of the boulevards Anspach and *du Hainaut* vie with, although on a smaller scale, the audacities of the Haussman administration. But it is not only in the local arrangements that Brussels can vie with Paris; all forms of progress realized with us are soon adopted by our neighbors, when they do not precede us, as has been often the case in the domain of theatrical representations, both dramatic and lyric.

Much has been said lately about the opening of a magnificent establishment built at Paris, near to the new opera house, in the *Rue Boudreau*, and which is only a repetition on a grand scale of a similar establishment inaugurated a long time ago in Brussels, *Rue de la Croix-de-Fer*, under the name of the Eden Theatre. In the picturesque design on this page an effort has been made to reproduce from a photograph one of the winter gardens which surround the principal hall of the Eden Theatre in Brussels. The decoration of the sides is extremely successful. Immense stalactites simulate in the background grottos under which jets of water gracefully gush out, whilst exotic trees and plants with the most varied foliage adorn the lower portion; above this mass of verdure the electric light from the Siemens lamps projects its brilliant rays, and the effect produced by reflections infinitely multiplied is truly marvelous.

C. C. SOULAGES.

THE WINTER GARDEN OF THE EDEN THEATRE, BRUSSELS, LIGHTED BY THE SIEMENS ELECTRIC LIGHT.

The *London Lancet* thinks that the electric light must soon become the common illuminant. This staid authority would scarcely reach a conclusion were the electric light a real source of danger to the eyesight.

Electric Rivals.

NEW JERSEY PHYSICS—A FEW FOREIGN OPINIONS — THE FRENCH CLAIMANT — COST OF GAS AND ELECTRICITY—GAS AND COAL AS FUEL—POSSIBLE ADVANTAGES OF THE FORMER — SATISFYING THE SKEPTICS.

[Written expressly for the ELECTRICAL REVIEW.]

Whether or not Edison has done more than others toward finding a solution for the electric light problem, he deserves, at least, the credit of inciting his brother electricians to renewed effort. Learned Professors had been working silently in their laboratories for years, practically to no purpose, when this young man—unschooled, fresh from an operator's desk—announced that he had found that which they sought. We will not here look into the truth or falsity of the alle-

gation that Edison but found again that which had already been discovered, though perhaps, were we so inclined, we might be so bold as to inquire of those who make the charge why, if the principle elucidated by Edison, was already discovered, it had not been practically applied? Were the discoverers too modest to assert their claims before an expectant world, or were they like the coral insects content to sink into obscurity upon reaching the point toward which they had long been struggling?

It was, doubtless, humiliating to the old gentlemen who had for years toiled amid the retorts and inductive coils—to say nothing of the bad smells—of the laboratory, to find themselves thus undone by a young telegraph operator, and they hastened to explain why they hadn't found the same thing, themselves. Some of them, of course, had found it long since (in their mind's eye), but had thought it of little importance as a permanent means of sub-dividing the current while others had been thwarted in their attempts to work in the right direction by reason of the interposition of what they thought to be well substantiated physical laws. Those who have ever succeeded in a large field, full of competitors, have experienced what jealousies and antagonisms are engendered by success, while many have been robbed at times from honestly won laurels, by those whose audacity was far in excess of their genius. For it is the fate of those who toil in already trodden fields to be exposed to censure without hope of praise, to be disgraced by failure or charged with imitation where success would have been without applause and diligence without reward. Edison was no exception to the rule. He was assailed on all sides, but perhaps by no one with such violence as that exhibited by a professor of physics in an institution of learning in Hoboken, who had been engaged by a gas company, if not absolutely to "toot" for them, at least to show that Edison was a dreamer, his claim founded upon a myth and his experiments expressive of such profound ignorance of physical laws, as to throw into convulsions of laughter, the callow youth who were so fortunate as to be instructed by the professor of New Jersey physics. This, of course, was conclusive evidence that all Edison's labors had been in vain, and it seemed the only course left him to close up his workshop, repudiate his patents and retire into a monastery; there to give over his dreams of scientific conquests and seek the soul-inspiring rewards of monasticism.

In his "Knickerbocker's, New York," Washington Irving has described to us the admirable scheme devised by Governor Stuyvesant and his pipe-smoking, beer-drinking counsellors for conquering the Indians by proclamation. He sent a ponderously fat Dutchman, who, after clambering up the side of the wall that lined the city, blew his horn vociferously to attract the attention of the Indians and then read them the blood-curdling proclamation of the governor, written in high Dutch. But as, by this proclamation, the Indians were not frightened to any great extent, so the terrible arraignment of Edison by the expounder of New Jersey physics did little more than prove that there was a professor of physics on the left bank of the Hudson whose existence the world had not, up to that time, been so fortunate as to be aware of. A friend of Edison's says that the first time he ever saw Edison excited was when he read what this man had said of his work. "I don't object to criticism," said Edison, "on the contrary, I like it, and court it But this man has transcended the bounds of criticism. To please the gas company which employs him, he has gone out of his way to attack me. Without understanding what I have accomplished, without knowing what my claims are, he gives an opinion. Starting with false premises, he draws the most ridiculous conclusions and makes assertions that verge upon imbecility. When I accomplish my work I'm going to set up a statue of an ass's head, place the observations this man has made, under it, signed with his name and underneath all the legend. 'But Masters, remember that I am only an ass, though it be not written down, forget not that I am only an ass!'"

M. Wilfred de Fonville, editor of *L'Electricité*, said, when he heard of Edison's claim of having sub-divided the electric light, that he never expected to hear of anything being accomplished in the direction in which, if the thing had not been exaggerated, Edison had been working.

M. Jean Baptiste Dumas, the famous scientist, said that upon first reading of Edison's discoveries he was incredulous, but he saw no reason why he should not be successful. He did not doubt that the carbonized horseshoes might be held by the platinum clamps for, he said, he had obtained in his own laboratory, carbonized Bristol board of certain cohesiveness; he could only render it incandescent, however, for the space of a few centimeters—the centimeter is about thirty-nine one-hundredths of an inch—by using the Bunsen pile of twenty elements. He said he was, therefore, led to conclude that Edison must employ considerable force, and he could not understand how Edison could long render incandescent a carbonized substance with such conductivity.

Mr. Dumas was mistaken, however, in reference to the high electrical resistance in the incandescent substance, for that was exactly the quality that Edison desired; it being the enormous resistance of the kind of carbon that is used in the Edison lamp that allows of the sub-division of the light.

M. Niaudet Breguet, who is a nephew of the well-known electrical manufacturer of Paris, said he found nothing new or astonishing in the discoveries made by Edison, except the manner of fabricating the carbon horseshoes. He said he found the electrical magnetic machines employed by him excessive, and that, in consequence of this, there must be a loss of magnetic force in the generation of the electricity.

M. Fontaine, president of the *Syndicat d' Electricite*, of which nearly all the French electricians are members, and editor of *Revue Industrielle*, said, that in his opinion, Edison had, by the employment of carbonized horseshoes, made an important advance in the application of the electric light, and he believed that this result had been obtained by a certain dexterity of manipulation of which Edison had preserved the secret, as, for instance, the judicious employment of the electric current during the process of carbonization.

It would, however, seem to be a refinement of sarcasm for the French electricians to accuse American electricians of concealing discoveries, for Frenchmen have been known absolutely to die in full and sole possession of a scientific secret never put to practical use in order that, if they didn't, at least no one else should reap a harvest or even gleanings, where they had sown. Like the boy who, thinking he has caught a fly, presses his fingers close together and then carefully opening them little by little to capture it, finds that there is no fly in his hand, the Frenchman issues from his laboratory and loudly proclaims that he has made a great electric discovery. Without saying what it is, he calls upon the whole earth, the heavens above and the sea beneath, to witness that he has found something that has long been sought unsuccessfully—a something which alone was wanted to render human existence bearable. Expectancy gives way to forgetfulness, and we have ceased to remember the ingenious Frenchman and his important secret when, upon the final success of an American inventor who, it is well known, has long been working conscientiously and intelligently in a certain direction, the Frenchman discovers his long pent up secret to the world, and lo and behold it is precisely the same thing that our countryman has himself invented and patented. The English make no pretense to the possession of virtue in this respect, or if they do they shouldn't, for there are at least some English electricians who seem to lie in wait for somebody to invent something in order to claim it. These men are to the roads of invention what the banditti are to some of the Italian post-roads. They do not even pretend to have invented an improvement which they covet and claim. They boldly knock the inventor on the head, take away his invention and sell it as their own.

There seems to be a well settled belief among the public, or at least that portion of it which has had, perhaps, neither the time nor the inclination to look into the matter, that the great fight of the future is to be between gas and electricity. Now, without any desire to pose as an authority upon the subject, we desire to express our humble opinion that there will be little or no struggle in the future between the two; that there will be harmonious co-operation between them, and that both will find their proper place and function. If the results of recent experiments have not been exaggerated, there is reason to believe that the gas companies will find it more profitable to supply their product toward the working of electric generators, rather than in using it directly as an illuminant. Those persons who are in the habit of making computations of the relative cost of gas and electricity, set down gas at the present ruling prices, viz.: $2.00 @ $2.25 per 1,000 cubic feet to small consumers, and 75c. per 1,000 feet to large consumers. Thus they obtain results by no means reliable. The fact is that the gas companies can sell good carburcted hydrogen gas at probably the half of these figures, notwithstanding that they loose as much as 15 per cent. by leakage during the day hours when there is little call for gas and the pressure is kept up.

There are numerous reasons why it is more economical to operate electric generators by gas engines rather than by the direct combustion of coal in a steam engine. After gas is expelled from coal there are several valuable products remaining, among which are coke, tar and ammonia. The sale of these, as may be imagined, greatly reduces the cost of the coal; and when added to this it is remembered that the coal is purchased at a very low figure, owing to the enormous quantities contracted for by the gas companies, it will readily be seen by those familiar with the economy of the new gas engine that coal used directly in the production of steam with a loss of about eighty-five per cent. of its power by combustion, could not be expected to prove a successful competitor.

For the same reason it is not unlikely that gas will, in the future, be used for heating purposes where now it supplies light. Against this the electrician might urge, and with truth, that electricity is not only light and power, but also heat, and that by the application of resistants the same wire that supplied a house with an illuminant might furnish it at the same time with fuel. Very true, but this would perhaps require an expensive plant altogether separate and distinct from the electric light apparatus; and if, as the present outlook gives us reason to believe there will be a demand for electric light and power at a profit far in excess of that which could be demanded for heat, the enormous outlay for a heating plant would be unnecessary.

But if by electricity more light, that is to say a greater intensity of light may be recovered from a gas engine than would have been furnished by the same gas if used as an illuminant, what would the result be when the electric generator is worked by the power drawn from a running stream? If all other means failed of successfully pitting electricity against gas, this alone would turn the scale in favor of the former; and, when it is considered that, through the interposition of the electric generator, the power of the stream may be converted at will into light, working power at a distance and if necessary even into heat, all computations between the two—gas and electricity—considered from a standpoint purely economical, would seem to be a waste of time.

Again, even were electricity, as an illuminant, more expensive than gas, when generated by steam power, the electric companies would have a palpable advantage by the transmission of power during the daytime over the same wires that furnish the light at night.

The engines, fuel and engineers are at hand, and at a small extra cost the valuable plant that would have stood idle during the day might be kept at work earning money. Just how much may be judged from a remark Edison made not long since to the writer, to the effect that could he be paid reasonable rates for supplying power to small workshops, say, in parcels of from one to ten horse power, he could afford to give away the light at night. He meant by this, that all the computations of the relative cost of the light with gas were absurd, since under the circumstances the amount derived from the sale of power during the day would wipe out the cost of producing the light at night.

But there are those who say this cannot be done, and if that section of the city where Edison is about to make the experiment should, in the near future, have power and light transmitted from one extremity to the other, at paying rates, the mathematics of those scientific and skeptical gentlemen who have insisted that the thing was impossible, will avail them nothing. They will, indeed, be placed in the awkward position of the man who exclaimed indignantly to his friend who was in the stocks: "They can't put you in for your offence!" and was answered: "But, d—— it, they have!"

International Electric Exhibition, Vienna, 1883.

The extent of the Vienna Electric Exhibition may be estimated by the fact that the motive power to be actuated has been fixed, in round numbers, at 1,000 horses. About 700 of them are calculated to serve for lighting the Exhibition buildings and grounds. The boilers and engines employed for the production of motive power will, in the majority, be of the fixed type, without, however, excluding portable boilers and engines. All those boilers and engines, of whatever type they may be, will be at the same time objects of exhibition. It has been proposed to arrange the boilers almost in the same way as they would be for permanent service, and so that they may be easily and agreeably inspected by the visitors. The machine department will thus prove a great attraction for the public in general, and particularly offer a good opportunity to engineers of making valuable comparative studies. We do not doubt that such an arrangement of the department of motive power will be preferable to those carried out at Paris and Munich, which were rather in a more temporary and subordinate way. Although such an arrangement will considerably add to the expenses, nevertheless the Commission has consented to sacrifice a greater amount of money, in order to secure an opportunity of general instruction, and thus bring the important question how to construct boilers and engines for electro-technic purposes more and more to its solution. Two important firms in the boiler line have separately offered, as an object of exhibition, each to furnish the whole number of boilers required for the production of 1,000 horse-power. The Commission, however, is, besides these most valuable offers, in possession of other numerous applications for exhibiting boilers, and is ready to accept still more, in order to offer all different systems an opportunity to show their relative merits.

We are glad to notice the movement among some of the manufacturers of electrical goods here to prepare for the coming exhibition, which bids fair to be one of the most important of the kind yet held. The Western Electric Manufacturing Company, of No. 62 New Church street, will send a large and thorough collection of electrical objects to Vienna, including telephone and telegraph instruments of all kinds. A special point will be made with the telephones, which have been manufacturered for the purpose, and are nickel-plated and very handsome. Among the article to be sent are:

FOR TELEPHONES.

Blake transmitters.
Edison transmitters.
Bell receivers.
Pony crown receivers.
Magnetic call bells of every kind.
Central office switches.

Storing Electrical Energy.

Continued from page 21, *March* 1*st*.

The gases in the tubes were formed by passing a galvanic current through the pair. The gases forming at each plate in well-known proportions. The battery being disconnected and the plates connected by a wire, a continuous current is produced exceeding that of a Daniell's element in electro-motive force. The current continuing to flow until the gases previously accumulated have recombined.

The current produced by the Grove gas battery is equal to the current which produced the gases by the decomposition of the acidulated water. A modification of this battery, affording greater surface of triple contact between metal, gases and acidulated water, promises the best of any form of storage battery for many uses.

In subsequent experiments Mr. Grove employed plates covered with peroxides of metals, and C. W. Siemens employed carbon tubes, very porous. The carbon gave a greater quantitive effect, with less intensity. The intensity was increased by coating the tubes by galvanic deposition of platinum before introducing them for charging.

In 1843, Wheatstone constructed what he was pleased to term a *galvanic* battery which employed platinum plates coated with peroxide of lead in conjunction with amalgam of potassium; in describing the same, he says, "such a plate is easily prepared by making it the positive electrode in a decomposing cell charged with a solution of acetate of lead."

In 1852, C. W. Siemens constructed a secondary battery by employing carbon plates impregnated and coated with peroxide of lead, in acidulated water; describing it he says: "The plates were dipped into a solution of acetate of lead. Then heated to dull redness, cooled, and again dipped in the lead solution. After repeating this operation several times the plates were acted on by galvanic currents by which the lead was converted into peroxide of lead. The current from the secondary battery thus formed gave two volts from a single pair. A larger battery of carbon plates thus coated and held separate by a porous partition gave good results."

The power of this form of cell depends upon the time of application as well as the power of the charging current. It affords a large amount of active surface in a small space, and is less expensive, and of less weight than batteries employing lead plates.

In 1859, M. Gaston Plante showed that lead was the most favorable metal for use in secondary batteries and he has since then multiplied proof of this superiority.

In its first form the battery of Plante consisted of sheets of lead held separate by a sheet or strip of felt, and rolled together to form a cylindrical shape to fit the glass jar. This battery thus constructed was filled with acidulated water and the peroxide of lead formed on the plates by the slow action of a galvanic current.

In the first formation when the battery is new there is an advantage in polarizing the electrodes first in one direction and then in the other, and in reversing several times the direction of the charge, but in subsequent uses care should be observed to always charge it in the same direction.

After the battery is "formed" the plates are found to be coated with an active layer of absorptive substance that will receive and discharge electricity.

The greater number of times a secondary battery is charged and discharged the better it is. Intervals of rest improve this form of battery.

He connected four or five elements or cells side by side, and charged them from three Bunsen elements, and connected them in series for discharging. The secondary currents are able to magnetize electro-magnets more powerfully than the primary currents from which they are derived.

It is found that when the resistance is considerable the current remains constant during several hours. It was found that a well "formed" element would give a good current several weeks after it was charged.

In order to obtain currents of great energy, a number of secondary elements are arranged side by side, and charged and connected in series to be discharged.

As commonly understood, Plante's secondary batteries were constructed only in view of scientific researches; he, nevertheless, used forms possessing industrial qualities. He employed the peroxide of lead as a cement or paste, pressed into spaces in a metal plate or electrode, in shape not unlike a gridiron.

In 1861, Charles Kirchhof described several modifications of secondary batteries. One of these batteries consisted of metal plates coated with mercury and immersed in acidulated water or in solutions of sulphate of copper. He describes another, consisting of plates of metal coated with peroxide of lead and spongy lead, by electro deposition in a solution of nitrate and acetate of lead. He describes using lead plates coated with mercury, and says: "Electricity from any source may be stored up, as, for instance, connecting these forms of batteries between a lightning rod and the earth to obtain atmospheric electricity, or with a rubber of a frictional machine, or with a magneto-electrical machine."

In 1866, Geo. G. Percival employed electrodes for secondary batteries, consisting of metal plates covered with crushed coke and powdered lead, in diluted sulphuric acid.

In 1869, Mr. Percival published a description of an improved form of secondary battery, consisting of a positive electrode of zinc, with a neutral solution of the positive metal, as Zn. So. 4. By this means not only is peroxide of lead deposited on the negative electrode, but there is also a finely-divided deposit of zinc on the positive electrode, and sulphuric acid is liberated.

By this arrangement a much more energetic chemical, and consequently electrical action, is developed, when the charging current ceases, than if both electrodes were of lead. He amalgamates the zincs.

In 1872, Deschanel, of Paris, employed a secondary battery, consisting of electrodes coated with metallic salts, mechanically applied.

He describes two electrodes coated by electro deposition, but says: "It is not necessary that the deposition of the substances on the plates should have been brought about by electrolysis. A similar result will be obtained if the plates be coated with the substances in any other way."

In 1879, Count d'Arsonval employed carbon plates covered by oxides of lead and manganese, coupled with zinc plates in solution of sulphate of zinc.

It will appear from the foregoing that a secondary battery can be formed by the use of gases in the presence of unoxodized electrodes, preferably of platinum or carbon;

By electrodes of different character, whether of different metals or of the same metals, surrounded or coated with electrolytes of different character; or

By electrodes of different chemical potential, made so by galvanic action.

It has been shown in the foregoing that secondary batteries have been used with electrodes coated with an active layer of absorptive substance, such as metal or metal compound that becomes spongy, and thus capable of receiving and discharging electricity, that the electrodes have frequently consisted of plates impregnated and coated with oxides, insoluble salts, and amalgams of metals applied as a paste, by electro deposition or otherwise.

The electricity received into secondary batteries is not retained as electricity, but is held in a chemical embrace, and gives out the electrical discharge by the action or chemical affinities as disclosed by Fabroni in 1799.

In all the foregoing described forms of secondary batteries, the electricity that is used to charge them, passes through them and does not accumulate in the battery as some might suppose, but in passing through the battery it acts to create a difference in chemical potential between the positive and the negative plates which constitute the battery, and when these plates are fully charged in their chemical relations to each other, and the charging current has ceased to flow, these batteries are then simply galvanic batteries, and in the act of being discharged they lose their power like other galvanic batteries, but they can be charged whenever exhausted by the action of electricity passed through them, and do not consume zinc and chemicals which require to be replenished.

Galvanic batteries which consume zinc and chemicals give electricity in abundance, and if they had continued to be the principal mode of supplying electricity we should not have so much need of secondary batteries, as it would be as well to employ these batteries direct as to store their energy.

But chemical consuming galvanic batteries are too expensive for producing light and power.

The development of Faraday's discovery that the motion of a coil of wire in front of the poles of a magnet or in a magnetic field gives rise to an electric current in the wire, has shown us that the burning of zinc or other materials in batteries such as Grove's or Daniell's, is a very expensive way of producing an electric current, and that it is far more economical to obtain electric currents by employing the best mechanical means we have to produce rotation of the coil of wire in the magnetic field. The different magneto and dynamo-electric machines (and they abound) are but the results of attempts to find the best form of coil, the best kind and best form of magnets, the best proportion of resistances, and the most suitable arrangements for the special work in each case which is required to be done. The dynamo-electric machine is very satisfactory as a mode of producing electricity, and both the electro-motive force and the current increase with the rate of rotation of the coil. This mode of producing electricity is like raising water to any level that may be required in each particular case; but the electricity must be used at once. This may be very inconvenient, and hence the necessity for something like a reservoir to store up the electricity. The labors of Faraday have shown us the relation between the quantity of electricity and the weights of the chemical elements decomposed by it in an electrolyte, and that these chemical elements may unite again to reproduce the same quantity of electricity. The object, then, to attain by means of secondary batteries is to find some substance which can be decomposed into two others which will remain apart, even when joined by a liquid conductor, until a complete electric circuit is made. Then these two substances should be at considerable difference of potential, so as to give a strong electric current in uniting again to form the substance from which they were decomposed.

Besides those secondary batteries previously described, convenient forms are had by employing a scroll of copper and a scroll of zinc, arranged as in a gravity battery, in a solution of sulphate of zinc, or—

By employing plates of lead, dish shaped, filled with red oxide of lead, or peroxide of manganese, covered with cloth or like porous layer, and set one on to the other; a dilute solution of vinegar or sulphuric acid can be used. A secondary battery employing a negative plate of palladium, which, during the action of electrolysis absorbs more than 900 times its volume of hydrogen with a positive pole of lead, is well spoken of. Good results are said to have been obtained by the use of iron turnings in place of the palladium plate, as it will absorb 200 times its volume of hydrogen in a solution of sulphate of ammonia of 50 per cent. of salt.

The negative electrode should have the property of absorbing hydrogen, and the positive pole should have the property of absorbing oxygen or of becoming peroxidized.

[*To be continued.*]

A Boston landlady, whose impecunious boarder owed her a bill of $50, was finally prevailed upon to take 18 shares of telephone stock, which then had no market value. She can now sell them for $5,000.

Electric Light vs. Gas.

A striking illustration of the economy of electric illumination over gas has been practically afforded for some time past at No. 182 Regent street, London, England, in the studio and photographic establishment of Mr. Henry van der Weyde, the son of the editor of this paper. He takes photographs by electric light alone, and uses for that purpose a Gramme dynamo electric machine, driven by a gas engine consuming thirty cubic feet of gas per hour, and producing an arc light, which by help of a parabolic reflector illuminates the sitter with a soft, but so active light that a portrait is taken in six seconds. Now, the question arises, if this same amount of gas, thirty cubic feet, were consumed by a number of ordinary burners, say, six five-feet burners, a picture could be taken by it in six seconds? Every photographer knows that this would be utterly impossible, and that the most sensitive preparations would require as many hours.

Or, to look at the matter from another point of view, thirty cubic feet of gas per hour is, per minute, half a cubic foot, and in six seconds one-twentieth of a cubic foot. *Question:* Is it possible to make a photograph by means of one-twentieth of a cubic foot of gas? *Answer:* It may be possible by the addition of combustion promoting chemicals to increase the quantity of light, just as it is possible to increase the heat produced, or the power by making an explosive mixture; but surely it is utterly impossible in the ordinary way of burning gas, which is very wasteful in all respects, not only in the production of light, as of heat and power.

It is, indeed, strange that in place of burning coal directly, it is more economical to employ the roundabout way of placing the coal in a retort, and heating it so as to transform its principal constituents into gas, and then, instead of using the gas directly, to burn it in a gas engine and generate power; then to transmit this power to a dynamo-electric machine, and transform it into magnetism and induced positive and negative electric currents; then to pass these currents over a conducting wire, and then place in the circuit so formed a few carbon points, and by separating them cause a local resistance, by which the two opposite electricities, while neutralizing one another and apparently disappearing, are transformed into a more intense light and heat than it is possible to obtain from the fuel used in the ordinary way of combination.—*Industrial News.*

The Microscope and the Electric Light.

Mr. C. H. Stearns, F.R.M.S., recently brought an interesting application of the incandescence lamp to microscopes before the Newcastle-upon-Tyne Chemical Society. A small Swan lamp of two or three candle-power is permanently attached to the microscope, and serves in place of the ordinary oil lamp, over which it has the advantage of requiring no cleaning, giving off no smell or much heat, and yielding a purer light. The great ease and facility with which the lamp can be adjusted is beyond comparison with the ordinary gas or oil flame, especially when the light has to be shifted to above or below the stage for illuminating opaque or transparent objects. Condensers may also be got rid of by its use. The light of the lamp is controlled by a small resistance coil, and two or three Grove or Bunsen cells are sufficient to work it. Where the battery must go with the instrument, and the latter is placed in a drawing-room or study, the heclamatic or bichromatic batteries are preferable, as they give off no offensive fumes. In Mr. Stearns' microscope, as shown to the society, there are three lamps—one above the stage revolving round its own axis, one below the stage fitted to the sub-stage, and one below the sub-stage for use with the polariscope. Each lamp is connected with a three-way switch, which sends the current to either lamp at will. Mr. Stearns also arranges the fittings so as to shift a single lamp to any of the three sockets mentioned, and thus save expense in lamps.—*Engineering* (*London*).

Cost of Electric Lighting.

The Fuller Electrical Company make the following estimate as the cost of electric lighting by their system:

"Owing to the various conditions under which intending users are placed—some already having ample power, either water or steam, while others have boilers, but no engine—it is impossible to give figures applicable to every case. It is therefore well, we think, to let each individual establishment figure power for themselves.

"In forming a fair estimate of cost of lighting, the subject seems, naturally, to divide itself into two parts; firstly, *cost of installation;* secondly, *cost of maintenance.* The first includes apparatus, dynamos, lamps, wire, services of competent men to properly prepare the plant for operation; *to which* must be added engine and boiler, shafting and pulleys, if these are not already available. Where the last are already in place, it is obvious that the *first cost* of electric lighting is very much reduced. The second division includes a fair charge on the investment on interest account; depreciation, which may be said to include wear and tear; carbons, attendance and power.

"By reference to our testimonials, it will be seen that electric light apparatus requires no more attention than any other well-constructed machinery. It is erroneous to suppose that the services of an electrician or expert are required after the first twenty days, during which the Fuller Company leave their men in charge.

"A twenty-light apparatus is an ordinary sized one, and we select it for purposes of estimate. Supposing we have a machine shop, mill or large store, hotel or factory to light, under ordinary conditions and dimensions, we make the following estimate:

TWENTY LIGHTS, FULLER SYSTEM.

Dynamo — 1 No. 20 Improved Gramme	$2,000 00
Lamps—20 Woods' Patent, @ $50 each	1,000 00
Wire—Say 1,000 feet, 3½c. per foot=10 feet to the lb., @ 35c. per lb	35 00
Cost of running circuits, about	100 00
	$3,135 00

"The cost of maintenance, including carbons, attendance, interest on investment and depreciation, is so moderate as to render this mode of lighting very economical to owners of isolated plants requiring large spaces to be lighted, and also to afford a handsome profit to persons making installations for the renting of lights, at rates which they readily command wherever introduced.

"The above machine requires not more than fourteen effective horse-power. For those unaccustomed to figure cost of power on a basis of steam, we append the following figures, which we believe are those ordinarily recognized by competent engineers:

When fires are built afresh each day for express purpose of running electric light apparatus, the coal necessary each hour to develop one effective horse-power is.....4 lbs.

When fires are constantly on and power is applied for other purposes, driving shafting, running elevators or heating, the additional coal necessary to develop one effective horse-power *additional* is.....2½ lbs."

Electrical Motors.

It is intimated that experiments will soon be made with a view of introducing electricity as a motive power on the elevated roads in this city. These experiments, which are to be made on the Thirty-fourth-street branch, will be conducted by Mr. Stephen B. Field, the electrician for the Mutual Union Telegraph Company. Mr. Field has been at work experimenting with electric motors for a long time, and claims priority in his ideas to both Siemens, the originator of the electric railroad in Berlin, and Edison, whose road at Menlo Park has been running for experimental purposes for over two years. Mr. Field first began his experiments several years ago, and afterward, at Stockbridge, Mass., constructed a road forty feet in length, upon which, with a dynamo-machine run by a 2½ horse-power engine obtained results which fully satisfied him that the elevated railroad cars in this city can be run much more cheaply than at present, and without the noise and smoke which render the roads a nuisance at present. Mr. Field has obtained permission from the managers of the elevated railroad to thoroughly test his experiments on the Thirty-fourth street branch, and says that several capitalists have promised to aid him financially in carrying them out.

According to Mr. Field's system in case of the adoption of electricity on the roads, of which he has no doubt when his experiments have been submitted to the management, there will be two stations or plants where the power will be generated from large dynamo machines. One of these stations would be placed at the Battery and the other at the Harlem River, on account of facilities for getting water necessary for the engines that run the dynamos. After the electricity is generated, it will be conveyed either to the present rails or else to a supplemental rail which could be laid in the center between the tracks. The current running through the track is then taken up by the wheels. By the simple turn of the lever in the engine the circuit can be broken and a train stopped. Any number of trains can be moved from one station to another, and all would be under the control of men at the stations, or even at the central station. The motor would be noiseless, Mr. Field declared, and of course there would be no smoke, cinders, or clouds of steam. By the new system, various sections of the track could be divided into blocks in which only one or two trains would be allowed, thus increasing the safety of travel in foggy weather. "In fact," said Mr. Field, "the trains would be under perfect control. If a train was at one station, the trainmen there could positively prevent another from coming up to it. Provision has been made for the stopping and starting of trains, also for the running of any number on the same circuit without the motion of one reacting upon others to any damaging extent." In regard to brakes, Mr. Field's idea was that they should be operated by electricity or compressed air, whichever should prove the most convenient for the purpose. If electricity was used, it would probably be taken from storage batteries. In the plan probably to be adopted, storage batteries would be used any way to furnish the electricity for lighting the cars. This power could be derived from the rails while the trains were at a stand still at stations. Alarm mechanisms or whistles, if their use was necessary, could be actuated by compressed air. According to one of Mr Field's plans, the locomotive is discarded altogether, the power being applied to the trucks of each car. In this manner an increased number of cars could be carried with each train, and it was a pet idea of Mr. Field that a short car should be placed at the front of the train, to be fitted up as a smoker, which would be used in the same manner as the dummies now drawing the trains. "However," said Mr. Field, "if an engine or motor is used, the entire weight for a forty-horse-power locomotive would not be much over 10,000 pounds, or five tons, which I think much lighter than those now used."

In regard to the cost of running trains, Mr. Field thought it would be at least fifty per cent. less than under the present steam system. An engine now required from eight to ten pounds of coal per hour for one-horse power. With the electric power on tracks, the expenditure would not exceed five pounds per hour to produce one-horse power. The wear and tear on the structure would also be much decreased, as the trains would run smoothly, and the motion would be uniform.

Mr. Field said that his claims of patents antedated those of Edison or Siemens. There was much litigation over the patents, but Mr. Field was confident that he would come out ahead. He was fully assured of the success of his motor, and thought it simply a question of time before it would be introduced on all the elevated roads in the city.

Mr. Thomas A. Edison said that Mr. Field was one of the trio who were fighting over patents. Already the testimony had been taken, but he did not think the matter would be settled for a long time, perhaps not for over a year. If the elevated roads should run electric motors, both Mr. Siemens and himself should consider it an infringement of their patents. Mr. Edison claimed priority in time over Siemens, and also Mr. Field, and thought that it would so be decided by the Examiner of Interference in Patents, before whom the matter was pending. Mr. Edison did not believe that the elevated people would introduce any new system as long as it was controlled by the present management. Mr. Edison said he had commenced his experiments with electric motors in 1880, and had run trains at times ever since at Menlo Park. He had now a freight and two passenger cars on the two-mile road at that place, and had also run three engines at a time on the road. His experiments had been satisfactory in all but an economic view, and of late he had made great advances in that point. A light train he could now run 65 per cent. cheaper than by steam. If it was heavily loaded with freight, the reduction would amount to only 40 per cent. He was now at work constructing a large engine of over 300-horse power, which he intended, when it was completed—and it would be finished in the spring—to try on a regular railroad, the Pennsylvania probably. This engine would be experimented with in carrying freight. Mr. Edison also stated that at Boston, next August, he intended to build a short road, upon which his electric motor would be run. As soon as the difficulties concerning the patents were settled he would be ready to take contracts for furnishing the locomotives. On his road at Menlo Park, already a speed of forty-two miles had been acquired, and the success of the system was assured. He thought a supplemental track should be used, so that both electric and steam trains could be run.

In reference to the elevated roads, Mr. Edison thought that the best use they could make of electricity, at present, would be to fit up the stations with continuous elevators, such as were used in several buildings in London. These elevators could be fed with electricity by means of wires from a central station, and the expense would be very light. —*Ex.*

Limits of Telephonic Action.

The power of the telephone to transmit the voice to long distances is intimately associated with its delicacy. Mr. Willoughby Smith has found by experiment that a telephone will work through a "resistance" of wire corresponding to 150,000 miles of telegraph line; and hence it would seem mere child's play to fulfil the words of the poet, and "waft a sigh from Indus to the Pole." But this was only a laboratory experiment; for on actual telegraph lines the leakage of electricity from the wire to the ground, damp, and other drawbacks, render the transmission of speech by wire far less easy in practice than was at first supposed. Nevertheless, it is on record that Mr. Edison transmitted speech over a line 750 miles long in America; and conversation has been carried on over 500 miles in India; 390 miles, from Tabriz, in Persia, to Tiflis; and 300 miles in Spain, Australia, and other places where the atmosphere is dry and pure. In England, we have not been able to work through such long circuits, owing to the wetness of the atmosphere; but Mr. Van Rysselberghe, the ingenious Chief of the Meteorological Obvervatory at Brussels, has telephoned from that city to Paris, a distance of 215 miles; and this while the same wire was carrying simultaneously an ordinary Morse telegraphic message. By a peculiar disposition of his apparatus, Mr. Van Rysselberghe spoke to Paris by telephone without any interference from the Morse signals that were traversing the identical wire at the same time.

The day after the bombardment of Alexandria, it was announced in the London papers that the noise of the guns had been heard at Malta by telephone through 1,000 miles of submarine cable. Experienced electricians took the statement with a grain of salt, because they knew that a submarine cable differs from a land telegraph wire in the greater retarding effect which it has on electric currents traveling along it. A cable has the effect of running together—jumbling up—the delicate and rapidly succeeding vocal currents of the telephone, and either muffling the articulation or creating absolute silence. Five hundred miles of land-line would make little or no difference on the distinctness of a telephonic message, supposing the wire to be well insulated from the earth; but 100 miles of ordinary submarine cable will probably be quite dumb. Indeed, some experiments made by the writer, with Dr. Muirhead's artificial cable, show that while the voice could be faintly heard through a length equivalent to fifty, or even sixty, miles, when it came to eighty miles no sound at all was audible. The inductive retardation had frittered away and blotted out the delicate undulations of the vocal currents. Telephonic messages have, however, been successfully sent by cable across the Channel, and from Holyhead to Dublin; but in no case has the length of cable reached 100 miles. The dream of whispering across the Atlantic under the "roaring forties" is likely to remain a dream for along time to come.—*Chambers's Journal.*

Electricity and Ears.

It is gravely affirmed in a floating paragraph that a person in Troy, having had to use a telephone a great deal during eighteen months, found to his dismay that his left ear, which he constantly applied to the instrument, had grown to three times the size of his right ear, and that it still continued growing.

Mr. W. H. Eckert, General Superintendent of the Metropolitan Telephone and Telegraph Company, said, when asked what he knew about the effect of electricity on the ears: "Well, I never heard of any such preposterous thing as the statement in that paragraph. I have heard it said that the use of the telephone was injurious to the hearing, but from the facts within my knowledge I do not hesitate to pronounce that absurd. I have been in the business, in Cincinnati and here, since 1878, and have never yet heard any complaint whatever of such an effect from operators who were steadily at the receiver of a telephone eight hours out of every day for months and years. I would certainly have known of it if there had been anything of the sort. The severest test that could possibly be made is by the effect during a thunder-storm, and I know that that produces no uncomfortable feeling, and is attended with no danger. We never stop work on account of a thunder-storm, nor did we do so in Cincinnati. In Cincinnati our receivers in the main office were all stationary, and fixed for the left air. In addition to them, however, I had put in at first receivers with flexible connections, that the operators might use to the right ear in case of necessity. After a time it appeared that these were useless, and I gave an order for their removal. Immediately a young woman—a very nice girl, and one of our best operators—sent in her resignation. I saw her, and asked her what was the reason for her going away. She began crying, and said that my order had rendered it impossible for her to do her work, and so she had to leave. It then appeared that she had always been entirely deaf in the left ear, though we had never suspected anything of the kind in the years she had been with us. Of course I let her keep the instrument she could use, and she was one of our best receivers. She was deaf before she came to us."

Six years ago on February 12, 1877, the first public exhibition of the telephone was made in Lyceum Hall, Salem, Mass., the report being sent by telephone to the Boston *Globe* and printed the next morning.

Extensions in New Jersey.

The managers of the Delaware & Atlantic Telegraph and Telephone Company are contemplating extensions of their service which will put their Philadelphia subscribers in communication with the residents of the principal towns in Southern New Jersey and the neighboring cities in Pennsylvania. They expect to spend $25,000 in these extensions. Connections will be made with Atlantic City, Cape May, Woodbury, Swedesboro, Woodstown, Salem, Bridgeton, Millville, Mount Holly, Trenton and Burlington, New Jersey. Besides having charge of the territory included in the southern counties of New Jersey, the company has also the State of Delaware. It is also proposed to join with the Philadelphia exchange the branch offices at Wilmington, Chester, Darby, Germantown and Frankford.

Another New Company.

A certificate incorporating the Overland Telephone Company was filed with the Secretary of State at Albany on the 24th ult. The company has a capital stock of $1,000,000, with power to increase the same to $10,000,000, and is formed to construct and operate telephone lines "from New York City to Albany, thence to Buffalo, touching and extending to all points in the State, into and across other States and Territories of the United States, and into and through the other countries composing the Western Hemisphere." The incorporators are Washington, New York and Brooklyn capitalists.

Telephone Talkers.

It has been noticed by people who have much to do with the telephone that people of different nationalities speak over the wires with different degrees of intelligibility, and some curious facts have been noticed in this connection. The American, naturally enough, is more readily understood than a foreigner speaking broken English, and he seems to take to the telephone more aptly than people of European birth. The German, ordinarily slow and quiet in conversation, becomes excited in the presence of a telephone, and talks rapidly and upon a high key. The Irishman's brogue comes over the wire sharply and distinctly, and he has little difficulty in making himself understood. The negro dialect, however, has peculiarities which render it difficult of being understood. Although the salutation "hello!" is not an elegant expression, it seems to answer the purpose perfectly. The combination of consonants and vowels is such as to create a distinct impression upon the instrument, and the accent coming strongly upon the final "o," aids very much in this effect. In some places attempts have been made to substitute a more polite word, but as yet there has not been found any word of greeting that answers as well as "hello!"

The Telephone in Moscow.

Our Russian correspondent, located at Moscow, states that the Telephone Exchange in that city had 260 subscribers connected on January 18th. The rates of rental are 250 roubles per annum. The rates are considered very high, or there would otherwise be many more, but even at present rates they are coming in rapidly.

A New Telephone.

Knowledge describes the receiver of a new telephone, which is based upon the principle that when an iron wire or rod is magnetized it suffers a slight increase in length with a compensating decrease in cross section. The inventors claim "the construction of a telephonic receiving instrument consisting of a magnetic wire attached to a sonorous disc or plate, and wound with a primary coil connected to a local battery and with a secondary coil connected to the telephonic line wire, as described." *Knowledge* anticipates very satisfactory results from the new instrument, which, even in its crude form, it says, reproduces sounds with remarkable clearness.

Kissing Through the Telephone.

This is the use to which the telephone is put out in Iowa, according to the Lyons *Mirror*.

An eves-dropper "took this off" the other morning when the thermometer stood at ten below:

He (in Lyons)—Is that you, dearest?
She (in Clinton)—Yes, love.
He—Put the mouth-piece to your lips.
She—Yes, what?
He—(Kisses) that!
She—Oh my! Was that lightning?
He—Did you get it dearest?
She—Yes, love—cool and distant, but so sweet. Call again.

The suit brought in the Supreme Court of New Jersey by Alfred Speer, of Passaic, against the New Jersey Telephone and Telegraph Company and John F. Noonan, for $1,200 damages, a case of trespass for placing two telephone poles on his property at Passaic, was tried before a jury at Paterson, Saturday, March 10. Hon. W. F. Gaston, of the New Jersey Legislature, represented the company and Mr. Noonan, and Mr. T. M. Moore, of Passaic, appeared for Mr. Speer. The jury brought in a verdict allowing Mr. Speer one dollar and six cents damages, which throws the costs of court on him.

This is a great victory for Mr. Gaston and Mr. Noonan, who presented their case to the court in excellent shape. They had on several occasions previous tried to compromise with Mr. Speer, but he would not accept less than two hundred dollars in cash, and his counsel and suit fees paid in addition.

Mr. Speer's expectations must have been something like the Prophet Wiggins's storm, failed to come off.

Yours truly,
Paterson, March 12, 1883. NOONAN.

We notice General Superintendent Eckert, of the Metropolitan Telegraph and Telephone Company here, has recently changed their Central Exchange office from New street to 198 Broadway. The change, which had to be effected very expeditiously, required a mile of cable, which was furnished them by the Western Electric Company, of Chicago, by express, the same day on which the order was given. The weight of this cable was four tons. We think the new location is far more central and preferable in many ways to the New street locality. It will be remembered as the location formerly of the principal exchange office of the Gold and Stock Telegraph Company in 1879.

A Lowell syndicate has bought out the Northwestern Telephone Company, with the right to the entire telephone business in Minnesota, in Burnett, Douglas, Polk and St. Croix counties, Wisconsin, and in the Territory of Dakota north of parallel 45. The lease from the American Bell Telephone Company is understood to be perpetual. Some Lowell men, with several of the present Western Board, will constitute a Board of Directors. It is understood the capital will be be $1.000,000. The territory bought has 1,500 subscribers.

The telephone has been introduced in the Sandwich Islands, and, the *Hawkeye* humorist says, as "hello" in the native dialect is "Kalakaihoikauhaubaihoihaukoi," you can imagine what kind of a time they have at the "central."

Under the able and energetic management of its enterprising president, E. T. Gilliland, and his assistants, Messrs. Crandall, Smith and Bassett, the Missouri and Kansas Telephone Company is rapidly opening new exchanges and developing its territory and business to wonderful proportions.

"More wonderful than any arch that architect ever elevated," said Dr. Talmage last Sunday, "or any transept window he ever illuminated, or any Corinthian column he ever crowned, or any Gothic cloister he ever elaborated, is the human ear." And yet in that marvelous structure the piercing telephone "Hello!" rings with remorseless redundancy.

SAN ANTONIO, TEX., Feb. 19, 1883.
Mr. Geo. Worthington.

DEAR SIR,—In regard to my last article for the REVIEW, I thought it might not be out of place to mention two more instances bearing upon the same subject. You can add or not as you see fit. They are:

First—A wire runs from the exchange to a subscriber, No. 123, three-fourths of a mile distant.

The wire there is grounded, and soldered to the water pipe.

Now, from the binding post, with which the ground wire is connected, another wire leading to a private residence is also grounded. The latter wire is about one mile long.

In this case, when 123 rings for the central or *vice versa*, the distant station, which has a separate and distinct circuit and instruments, is also rung up, and a switch and separate ground have become necessary to avoid confusion.

Second—A wool-scouring establishment, seven miles down the river, is grounded to the same wire that grounds the city office to the exchange; and frequently, when the mill is ringing for the city office through a separate set of bells, the number in the central office drops.

This case can be more readily accounted for, perhaps, than the others, in that the city office and central are very near together.

Third—Two wires connecting the exchange and I. and Gn. ticket and train dispatchers' offices were grounded to a common gas-pipe.

The telegraph wires of the T. D. were also hitched on to the G. P.

Very soon the phenomenon of a cross with a telegraph wire was observed—an accident that would not have been noticed but for the conviction that the telephones were far out of reach of the galvanic wires.

As the undersigned had long since foregone the use of such hieroglyphics as "233 o, t, 6 Mo Pac. fts 5 T. C. Box," *ad infinitum*, the telephone wires were grounded elsewhere and work O. K.

It is not known how the wires of the T. D. found earth after this; but, in view of his successful solution of weightier matters, the conclusion is not far-fetched that his usual serenity has been restored.

These stations are over a mile from the central office, and the return through earth, owing to their circuitous route, is shorter. Hence, no noticeable interference between them; but it is beyond question that a common ground for two or more wires running straight away from the central will almost invariably produce a disturbance between them, if it does not, as has been frequently observed, simulate a cross, owing, of course, to the provision of a metallic circuit.

This, probably, is not the kind of evidence desired by the advocates of "the earth a reservoir."

Very truly,
J. K. DUNBAR.

George Worthington, Esq.

DEAR SIR,—I noticed lately the announcements of several new "District Telegraph" Companies both in the United States and in England. It may interest you to know that even in this remote capital we have recently estatablished a district company, furnishing messenger, police, fire-alarm and *telephone* service, which is meeting with a very satisfactory reception from the Rio public. Its officers are C. P. Mackie, President; Wm. I. Donshea, Gen'l Sup't and Electrician; and Victor Dias, Manager. Mr. Mackie is the attorney in Brazil of Prof. Alexander Graham Bell, and the founder of telephony in the Empire—the Government having given him the first concession in 1879—and Mr. Donshea was sent out by the Continental Telephone Company in 1880 to erect the exchanges establi-hed under this concession.

Yours, very truly,
WM. I. DONSHEA, G. S.
Rio de Janeiro, Feb. 14, 1883.

Electrical Engineering.

We extract a few remarks from the *Mail and Express*, which are very pertinent, and show some progress on above subject:

In reviewing the report of the plans of the Columbia College authorities the other day, reference was made in these columns to a School of Electrical Engineering, which President Barnard said was needed to extend the scope of the college. On Tuesday of this week a meeting of the committee appointed to consider the project was held, Mayor Low, of Brooklyn, being the chairman, and definite plans were proposed for the immediate establishment of such a school. Estimates had been obtained from Mr. Edison as to the cost of the necessary "plant," and it was said by that gentleman that $15,000 would cover the first cost. After that the school could be kept up for $25,000 a year.

It is proposed to ask the different telegraph and telephone companies to supply the plant and contribute $12,000 a year to the support of the school, which would be of great help to them in furnishing, what is now difficult to get, trained electrical engineers, such as they need for the successful operation of their business. In case this request is granted by the companies, the school will at once be established, the present professors taking a share of the work, and new professors being engaged so far as necessary. We hope the committee will be successful. Such a school is needed, and its establishment would be a good beginning in the building of that great university at which the college authorities are aiming.

A Long-Distance Telephone.

WASHINGTON, March 16.—Myron L. Baxter, of this city, has been awarded letters patent for a long-distance telephone, which, it is said, recent tests have shown to be capable of overcoming in a remarkable degree the difficulties arising from induction and other disturbing influences.

The Department of State has received from the Consul-General at Calcutta information concerning an international exhibition to be opened at Calcutta on the 4th of December, 1883, with circulars and blank applications for space. One thousand feet for general articles and one thousand feet for machinery have been secured for American exhibitors. The exhibition will be conducted very much on the plan of the late exhibition at Melbourne. Circulars giving full information and blank applications for space may be procured from the Department of State.

A Chicago paper says that a printer in that city has been cured by prayer. It does not say what the printer was cured of, If he was cured of extracting the word in a paragraph on which a joke hinges, and substituting a word of his own "to make sense," as he puts it, we will indorse the prayer cure and give it a five-inch electro ad. free, one year, top column, next to reading matter.

We are sensibly aware of the fact that we missed a very pleasant meeting, to say nothing of the elegant dinner, etc., etc., by not being able to meet General Supt. Keller, General Agent Beetle and other veterans in the telephone field at the Potter Palmer House on Tuesday last. We are happy to learn that they adjourned to meet in New York at an early date, where they are assured of a hearty reception.

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NEW YORK, MARCH 22, 1883.

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To Our Patrons.

With this number the TELEGRAPH AND TELEPHONE begins its career as a weekly under a shorter and more comprehensive title, viz.: THE ELECTRICAL REVIEW. It would seem proper, therefore, that we should explain to our readers and patrons the causes which have impelled us to make this change; to specify clearly what departures, if any, are to be made in the future policy of the journal, and we may, perhaps, be pardoned, if at the same time we dwell for a moment upon our own labors of the past year and the gratifying success that has attended them.

In one short year the TELEGRAPH AND TELEPHONE has advanced step by step from a puny infant until now, at the beginning of its second year, it stands the acknowledged representative of the American electrician. But it is not alone in America that the TELEGRAPH AND TELEPHONE has been received with marks of popular approval. Our foreign files, and the numerous letters we have received from Great Britain and the Continent, indicate, beyond peradventure, that it is recognized on the other side of the Atlantic, as the accredited exponent of electrical progress in America.

The career of the TELEGRAPH AND TELEPHONE may be looked upon as a proof that a straightforward policy and fair dealing in the making of a journal will, together with good management, assure its success.

We set out to represent the interests of electricians and their patrons without fear and without favor, and the coöperation we have received from one end of the land to the other from both classes of our clientèle is the best kind of assurance that we are successfully carrying out our mission.

Innovations and important inventions have been of frequent occurrence in America, but the rapidity with which one electrical invention treads upon the heels of its predecessor is phenomenal. For this reason, and warranted in the extra outlay by our past prosperity, we have decided to issue our journal weekly instead of fortnightly as before. This will enable us to keep the very freshest electrical news constantly before the public. The former policy of the journal will not be departed from. We shall direct the public eye to sound and practicable electric inventions, while at the same time exposing fraud and deception which, in the electric world as elsewhere, has a being.

The new name has been found to better express the aims of the journal, since the latter does not represent alone those interested in the telegraph and the telephone, but also everybody interested in the application of electricity in any form.

The ELECTRICAL REVIEW starts out under the most flattering conditions. Mr. Delano, who has taken an interest in the REVIEW, has had an experience of nearly twenty years in the newspaper world, as a publisher, (his father one of the early pioneers in the publishing field began in 1835) and is already too well and favorably known to need any introduction here, as his name in that field is a sufficient guarantee of the success of any enterprise he may be identified with The editorial staff has been increased as well as the number of correspondents both here and abroad, and the enlarged edition, printed weekly, will be distributed throughout America and Europe.

And now, hoping to secure that patronage in the future which has been freely accorded it in the past, the ELECTRICAL REVIEW makes its bow to the Public.

The ELECTRICAL REVIEW will be sent this year to all the present subscribers to the REVIEW OF THE TELEGRAPH AND TELEPHONE for the same price as they are now paying for the old REVIEW, *i. e.*, $2.00 per annum. On all subscriptions to this journal, which are not renewed during this year, the subscription rate will be $3.00. We think our readers will appreciate the above terms, which are considerably lower than any of our first-class contemporaries in the electrical field, who are publishing weekly journals.

Innovations, Past and Present.

When Sir Humphrey Davy, the famous English chemist, was apprised of the project of forcing carbureted hydrogen gas through a system of pipes for purposes of illumination, he is said to have laughed in derision. He could not believe that such a plan was feasible, nor that it was capable of development without danger alike to person and property. But the skepticism of Davy did not deter the ingenious inventor from carrying out his work, and finally pushing it to a successful issue. The result is before us. For years we have seen gas play an important part, and if now it must give way, so far as an illuminant is concerned, to the electric light, other fields doubtless will be found wherein it may be profitably employed.

As with gas so it was with another important invention, viz.: the propeller. In the second quarter of the present century, Captain John Ericsson, a Swedish engineer, towed the admiralty barge down the Thames river at the rate of seven nautical miles an hour with a steam launch, wherein the oblique action of the screw replaced the direct action of the paddle. But, after three months' deliberation, those ingenious landsmen composing the British Admiralty, decided that Ericsson's invention was of little account, as it would interfere with a ship's steering gear. Disgusted, Ericsson came to this country and we know the result. To-day all steamships are propelled by Ericsson's admirable device.

It has been much the same with the electric light. Certain mathematicians and self-appointed censors of electric innovation rose up in arms against its use; the first claiming that it could not be economically diffiused, and the latter that it could not compete with gas as a steady illuminant. But notwithstanding these and similar assertions the able men who sought to find a complete solution for the problem kept on in their work amid difficulties of which it would be useless to complain, and have finally brought their labors to an almost successful culmination without one act of assistance, one word of encouragement or one smile of favor. To be sure, their labors are not yet complete. A few wild blunders and risible absurdities, from which no work of such multiplicity was ever free, may, for a time, furnish folly with laughter and harden ignorance into contempt But as each successive obstacle in the path of electric light progress is successfully removed, the general public comes to look upon the project with more and more favor, and rejecting the counsel of inconsiderate and sometimes unscrupulous critics, shows its appreciation by demanding the new light for dwellings, factories and thoroughfares.

Recent Telephone Experiments.

The recent experiments with the long distance telephone were interesting, as showing what possibilities the future has in store for telephone development. We shall be greatly astonished, however, if anything practical comes of such exhibitions—at least for some time to come.

Our contemporary of the *Evening Post* alludes to the matter somewhat enthusiastically, as follows:

"Conversation was carried on between New York and Cleveland recently by telephone, with as much distinctness as between offices in the city half a mile distant from each other. The experiment was made with an improved wire, consisting of a steel core surrounned by copper. There is every reason to anticipate that this 'wonder of wonders,' as Sir William Thompson styled the Bell telephone when it was first brought to his notice, will eventually be made to work over any circuit which the Morse instrument can cover A few days since the announcement was made that Buffalo had been brought into telephonic range from New York; now it is Cleveland; soon it will be Chicago. The effect upon telegraph property of these rapid strides of the telephone is altogether matter of conjecture, but it seems to be certain that, if long distance communication is made as easy and effective as neighborhood communication now is, it will take some part of the business now transacted by telegraph."

We are inclined to believe, in view of the fact that the American Bell Telephone Company own or control about all the important patents upon which the whole system of telephoning is based, that, unless they initiate the long distance system, it will not be developed to any extent for the present. It is not the want of instruments to do this service that deters them from undertaking it.

The Postal Telegraph Company.

Our readers will doubtless be interested in a brief account of the operations of this company and its peculiar systems of telegraphy, especially in view of the fact that recent consolidations have given this new enterprise a great importance commercially, as one of the most formidable competitors for business that the Western Union Company now has to deal with.

The Postal Telegraph Company have boldly entered a field comparatively untrod and unmarked by the guide-posts of experience, both in the construction of its lines and in its special methods of transmission. The wires, which are now completed and working from New York westward as far as Cleveland (650 miles), are composed of a steel core, on which copper has been deposited by electrical action similar to that used for depositing the zinc coat on ordinary galvanized iron wire; weigh 500 lbs. to the mile, and have an average resistance of 1.65 ohms per mile. As No. 4 iron wire, the largest gauge now used by any telegraph company, weighs 886 lbs. per mile, and has an average resistance of 5.51 ohms per mile, the gain in weight and conductivity by using the former is seen to be enormous. Of course, the two grand problems the new company has to encounter here are, first, will the new compound wire be sufficiently durable, as compared with the iron wire, in proportion to its conductivity, to pay for the evident enormous increase in its cost; and, secondly, will the gain in conductivity, and consequent capacity in speed of signalling, be sufficient to repay, by its larger earning capacity, for its increased cost? The first question is one which time alone can answer. It appears, however, that difficulties have already arisen in respect of that *bête noir* of compound wire, the sleeve joints, many of which, owing to hurried or unskillful workmanship, have "pulled out," thus leaving the circuit open. It appears as though the defective joints in this sort of wire might be as fruitful a source of interruption as the flaws and cracks produced in the process of manufacture are in ordinary iron wire. In respect of the second question, the result of experiments hitherto made furnish a triumphant affirmative reply. Telephone conversations are continually carried on between New York and Cleveland, with the greatest ease and distinctness. The Leggo automatic system has transmitted and received 800 words per minute on these wires, in the presence of the writer, in clear, plain beautiful Morse characters.

Of course, the full transmitting capacity of such superb conductors as these could never be developed by such antiquated methods as Morse quadruplexes, or even the Wheatstone rapid system. Accordingly, the company have adopted, and are now experimenting with two improved systems. One is the Gray Harmonic system, by which six or more series of tones, sent over a wire, cause sympathetic vibrations in reeds actuated by electro-magnets at the other end of the wire, each reed responding, of course, only to its own particular note, remaining silent when vibrations of another pitch, or rate per second, come over the wire. These reeds are switched in and out of circuit at the sending end by transmitters operated by ordinary Morse keys, and at the receiving end the reeds operate ordinary Morse local sounders. Each tone can be duplexed; consequently a transmission of twelve messages

on one wire at the same time is theoretically possible.

The Leggo system, which we are unable to describe in detail at present, consists essentially of the following parts: A metallic cylinder, of any convenient length and diameter, is made to revolve at a suitable rate of speed by any source of power. At the same time that it revolves, it receives a lateral motion from an endless screw, so arranged that a style resting motionless on the periphery of the cylinder would trace a continuous sinuous line, like the thread of a screw, all round the cylinder and throughout its length This style carries a small capillary tube, fed with insulating ink from a reservoir, and normally rests on the cylinder, being held there by a spiral spring, and is always in position to leave a line of ink on the cylinder. This lever is pivoted in the middle, and on its other arm is attached an armature, placed above the poles of an ordinary Morse sounder magnet. Consequently, when the armature is down the ink-feeding lever is up and removed from the cylinder, and *vice versa*. A key and local battery complete the circuit of the Morse sounder. Now suppose the cylinder to be revolving with the style resting on it, and a Morse operator to be sending ordinary Morse characters with the key. The result will appear in a sinuous line of ink-marks representing the spaces in and between the Morse characters, and a series of blank spaces between the ink-lines, representing the Morse characters themselves; so that the ink lines present a graphic representation of the "back stroke" of the sounder. When the cylinder is full (it will hold 1,200 words), or when a convenient amount of matter has been recorded, the stylus is withdrawn, the cylinder slid back to its former position, and a circuit-closing platina point, connecting the line wire and battery to the cylinder, is then placed over the lines of ink and spaces, and the cylinder is revolved as before, but at a much higher rate of speed. The result now is that the circuit is closed whenever the platinum point touches the metallic portion of the cylinder between the lines, and the circuit is opened when it touches the ink-lines themselves. In consequence the Morse writing is rapidly transmitted over the wire to the distant station, where it is recorded on chemically prepared paper, as in the Bain and other chemical systems. The special methods for "clearing the line" between the signals, and neutralizing the effect of static induction in the conductor, are novel and effective, but cannot be described in detail until the rights of the inventors are fully secured.

There is no doubt that this system possesses many advantages, in respect of simplicity and consequent greater freedom from liability to derangement, over any other automatic systems hitherto adopted in this country.

A Hint to an Enterprising Electrician.

The application of electricity to mechanical movement was never so popular as now. We have telegraphy, electric motors, electric railways, electric tricycles, electric flying machines, and other and numerous machines and contrivances.

But singularly enough, while electricians have been searching far and near for opportunities of applying their favorite natural force, they have overlooked a rare chance, not only of conferring an inestimable boon upon the public, but at the same time of attracting a plethora of golden shekels to their not always well-lined coffers.

It would seem to be a fitting duty of the ELECTRICAL REVIEW, which represents and guards the interests of electricians, to point out without further delay that which the public is now looking to electricians to supply it with, and we would fail in our bounden duty were we to refuse to make at least the suggestion.

What is wanted is a chair connected with either a powerful battery, Planté accumulator, or a small dynamo machine. This should be handsomely upholstered, and have an air about it at once inviting and comfortable. In a city house it should be designed for the front hall, but might be placed on the front stoop of a country house.

Now for the application.

An ugly-looking tramp comes shuffling up the path which leads to the country dwelling-house. He is about to go round to the back of the house to annoy the servants, when lo! he espies a comfortable arm-chair upon the stoop. With the freedom, not to say utter abandon, which characterizes those who follow his calling, he throws himself unrestrainedly into the chair, with one leg hanging over the arm, and soon falls into a peaceful snooze. About this time the owner of the chair, sitting in his library adjoining, presses upon a button. Hello! hello! why, what's the matter! The tramp seems to be suddenly thrown into convulsions. He shrieks and screams with rage and pain. Then the current is turned off, and the tramp, having had a severe lesson in good manners, totters down the steps and hurries toward the gate, fearful of touching anything else about the place lest he receive more of that terrible shooting agony he experienced in the chair.

In city houses, as has already been said, the chair is placed in the front hall. Enter a book agent. Twelve times in succession the servant tells him she does not want to buy any books, because, as she don't know how to read, it would be a waste of money, and, as her master is blind, he does not take kindly to reading either. Nevertheless, he persists.

"Very well, Mary Jane," calls out the girl's mistress from the top of the landing, "ask the man to take a seat, and close the door!"

One of the few things the book agent will regret in after-life will be that he accepted this invitation. The passage of the electric current, when turned on by the lady at the head of the stairs, makes his trembling limbs stick to the chair, "curdles his young blood, makes his eyes, like stars, start from their spheres, his knotted and combined locks to part, and each particular hair to stand on end like quills upon the fretful porcupine."

But a still more important use of this electric chair would be its application in fashionable churches, whereby it might be possible for the pastor to wake up the leading lights of the congregation just before he made his most telling points. On the other hand, a wire connecting all the pews with the pastor would enable the congregation to cut short a too voluminous dissertation upon an uninteresting theme; and the unmannerly idiots who talk loudly at the theater and opera might be shocked into silence, if they couldn't be shamed into it.

(For the Review.)

A Curiosity in Night Alarms for Central Offices.

In the issue of the REVIEW for Dec. 15th, 1882, a short article appeared upon the above subject, describing a fault to which the particular alarm therein referred to, was sometimes liable. The alarm there spoken of, was the style ordinarily used, viz.: that in which a circuit closer is placed beneath each annunciator, which by the fall of the annunciator is actuated to close a local circuit including a battery and an alarm bell.

When any of the drop, come down, the bell of course rings.

This alarm has been very useful, and has well subserved its purpose. There are, however, certain disadvantages, contingent upon its use: One of these, and we conceive the worst, is the necessity of having so many circuit-closers; one for each drop.

For, as in the multitude of counsellors there is wisdom, so in the multitude of contacts there is weakness.

Another trouble to which such alarms are liable, is contact between the cores and helices of the annunciators, and this trouble, with its consequent results, and their explanation formed the text of the former article.

For the obviation of some of these defects several contrivances have been suggested. One of the most ingenious, because of its great cheapness and simplicity, is the device we are about to describe.

It is the idea of Mr. Edward A. Woelk, now of Detroit, Michigan, but formerly manager of the Telephone Exchange at Springfield, Missouri.

The broad feature of the arrangement is the substitution of a single circuit closer, for the number heretofore employed.

The elements required to construct this alarm, are follows: one vibrating bell, two cells of Leclanche battery, one circuit closer, and a string, adjustable as to tightness.

At one side of the annunciator board of the central office switchboard is placed the circuit closer, which we shall now describe.

A strip of stiff sheet brass is either pivoted or clamped in an upright position, and has a platinum contact point at that side of its free end, which is nearest to the switchboard. One pole of the battery is permanently attached to this brass strip.

The other pole of the battery is united by a wire to one of the bell binding screws.

A fixed contact point is fastened to the side of the annunciator frame, but insulated therefrom, and is connected by another wire with the second terminal of the bell.

When not in operative condition, the contact point of the pivoted or clamped slip of brass is held by a suitable retracting spring at a distance of about a sixteenth of an inch away from the stationary point, and it presses against a back limit screw which prevents it from falling too far back.

A common string is fastened to the middle of the upright brass tongue, and stretched across the board in front of the drops, and at a point in height a little above their point of rest, when fallen. This string is furnished with a tightening screw at the opposite side of the switchboard, whereby it may be tightened up at night, or let down during the day. The arrangement is now complete. Let us see how it works.

When we wish to make the alarm operative, we wind up the tightening screw until the string is so tight that it does not sag, but stretches in a straight line in front of all the drops. The circuit closing brass spring or strip is still held back and away from its contact point by its retractor. But if now any of the drops fall they must necessarily fall upon the string, since that stretches above the point of rest; and if they fall upon the string they must also of necessity tighten it; and the string being suddenly tightened, pulls the brass strip away from its back limit, and up against the stationary contact point, closing the local circuit and ringing the bell, which continues to ring, until the weight of the drop is removed from the string.

The New York Electrical Society held its annual meeting on Friday evening the 9th inst. The President, Mr. F. W. Jones, made a few interesting remarks upon the present very prosperous condition of the society and its rapid growth. The statement of the financial secretary showed a large balance in bank to the credit of the society. The annual election of officers was, after the election of president for the ensuing year, postponed until the next meeting. Mr. Jones, having been unanimously nominated for re-election for a third term, declined the honor, stating that his increasing business interests in the electrical field claimed too much of his time to admit of his assuming any further duties at present of that nature, but assured the society of his hearty support in the future as in the past. Many expressions of appreciation of the retiring president's energetic management and successful promotion of the society's interests were heartily given him by the members present. After the election of Mr. Charles H. S. Small, the well-known superintendent of the Gold and Stock Telegraph Company of this city, to the office of President for the ensuing year, the meeting was, upon motion of Mr. Bradley, adjourned to Friday evening, the 16th, at which time the old officers of the Society were elected.

The telephone companies under Lowell management have made a net gain of subscribers during the month of February, as follows:

National Bell of Maine—Connected Feb. 1st, 3,699; gain in February, 40; connected March 1st, 3,739.

Boston and Northern—Connected Feb. 1st, 2,822; gain in February 117; connected March 1st, 2,939.

Bay State—Connected Feb. 1st, 2,332; gain in February, 74; connected March 1st, 2406.

Union—Connected Feb. 1st, 256; gain, 4; connected March 1st, 260.

Suburban—Connected Feb. 1st, 1007; gain 93; connected March 1st, 1100.

Granite State—Connected Feb. 1st, 411; gain 3; connected March 1st, 414.

Acquired by purchase (Northwestern), 1400; net gain for the month, 1731; grand total under Lowell management, March 1st, 12,258.

Mr. Charles H. Denman of the telephone office has been appointed to the position of cashier of the Northwestern company, and will take up his residence in St. Paul or Minneapolis. Mr. Denman is a young gentleman of fine executive ability, and during his short stay in Lowell has made hosts of friends, who will regret his departure.

The Manhattan District Telegraph Company have just leased the entire corner, at Broadway and 31st streets to enlarge their district office, and to accommodate telegraphic connection. This, when enlarged, will be the finest district office in the city. They have also secured the location of a district office in the triangle at 23d street and Broadway, now occupied by the Erie Railroad.

Indianapolis, Ind., is becoming quite a center for telephonic operations. This is owing to the formation of several large telephone companies by Mr. E. T. Gilliland, of which he is the president, and the location there of a factory exclusively manufacturing telephonic apparatus under Mr. Gilliland's patents.

AN ELECTRIC LIGHT CONVENTION.—A convention of Brush Electric Lighting companies will be held at Cincinnati, O., on Tuesday, April 10, for the purpose of selecting an incandescent lamp to use with their storage batteries.

The trial of the Tripp electrical tram-car in London, a few days since, was very successful. The car ran a distance of four miles very satisfactorily, and fulfilled the requirements of the Board of Trade. We will give details of these experiments in a future edition.

A New Electric Light Company.

A new company to operate the State of Colorado under the Edison system has just been formed at Denver. Several names well known to the telegraph fraternity will be noticed among the officers: President, William Orton, New York; Vice-President, William Moore, Denver; Secretary, William M. Cox, Denver; General Manager, S. T. Armstrong, Denver, Col.

Wanted—More Explanations.

I have been very much interested by an article on "Electricity," signed by Mr. Geo. Le Cronier, in your valuable number of the 15th of January last. I am not an authority to criticise it, but, on the contrary, I wish to have more explanations, as I do not quite understand.

It appears "we are told that water is a conductor and that glass is a non-conductor." Conductivity, I thought, was a word used in a relative and comparative way, as we cannot prove that anything is absolute. Mercury, compared to pure copper, is a bad conductor; it opposes fifty times more resistance to the passage of electricity than pure

copper. Still it is a very good conductor indeed compared to water saturated with common salt, the former being 43,000 times more conductive than the latter. And, again, this salty water is some 60 times more conductive than pure water. I will not let the readers figure out that pure water is *one hundred and twenty-three million* times less conductive than pure copper. I do not know the relation of conductivity between pure water and glass, but what I do know is that glass is a *very bad conductor* compared to an ordinary lightning-rod, but is not a *non*-CONDUCTOR of electricity; consequently it is not "as much a conductor as the lightning-rod" as Mr. Geo. Le Cronier teaches us. Mr. Cronier is perfectly right when he adds that "as both conduct, both should be called conductors; but it appears to be a play upon words—something like this: One man has a cent, another has ten million dollars; therefore they both have money. N. B.—I do not exaggerate much the difference of wealth in my comparison.

Proceeding, we are told, speaking of water, "that a lightning-rod is put into the ground where it is damp, that the water or dampness may conduct it." One not familiarized with the subject would be led to suppose from the above sentence that the dampness is sought to conduct the *lightning-rod*. The writer adds: "But instead of conducting it, it is the best element to kill it, and this is the use that it answers."

I do not think that the water or dampness is there to kill the lightning-rod; or, if the writer wishes to say that it kills, on the spot, the poor electricity which may be circulating up or down the rod, I again object. Here is what, *I think*, we are told.

The junction of the earth with a lightning-rod should not offer a greater resistance to the passage of electricity than the rod itself. As dry earth is found to be more resistant or less conductive than damp earth, and damp earth less conductive than a metallic rod, it is necessary to increase the surface of the rod when it reaches the ground, in order to diminish the resistance of the junction.

If a cloud charged with electricity passes over the rod, it decomposes by influence the neutral fluid of the latter, repels the electricity of the same sign and attracts the other, which, in escaping from the point, goes to neutralize that of the cloud.

If this neutralization cannot completely take place—that is to say, if there be a discharge—it is the rod which receives it, thus preserving the bodies in its proximity.

I wish to know if that portion of electricity which goes into the earth through the lightning-rod is killed then or there by the mere dampness of the ground, or whether, damp earth being a better conductor than dry earth, the dampness is only sought to facilitate its dispersion through a smaller earth plate than could otherwise have been used had the earth been dry.

I read the next sentence: "The vacuum current that pumps in water the narrow space from wire to wire is not done by the conductivity of the water, but despite it, as the interval must be just in proportion to the strength of the current; if increased, the leap cannot be made; if water was (sic) a conductor, the greater the interval the greater the conductive power." Very true; the current pumps despite of the water, because it is a poor conductor compared to the remainder of the circuit. But does it prove that water is not a conductor, and does it lead to asserting that if water were a conductor, the greater the interval between two ends of a metallic circuit immersed in it the greater will be its conductive power? According to that, if a speaking tube conducts sound, the longer it is the better it will conduct it and the louder the sounds will be. Or, again, if Mr. Le Cronier admits that *in conductors the conductive power increases with their length*, I want more explanation.

GEO. P. GRIGNARD.

Paris, March 1st, 1883.

We wish to tender thanks to General Agent Beetle and General Supt. Duxbury for the favors received, and are very happy to know that we may have the pleasure of seeing them soon.

MOVEMENT IN FAVOR OF SUPT. HERN OF THE MUTUAL UNION TELEGRAPH.

A petition that will certainly carry great favor (for its signers represent $50,000,000 of Boston capital) was forwarded from this city recently to New York. It was addressed to Gen. T. T. Eckert, vice-president and general manager of the Western Union Telegraph Company, and a large number of gentlemen whose names were affixed, respectfully asked that Mr. D. J. Hern, superintendent of the Mutual Union Telegraph Company's lines in this section, be designated, in the forthcoming change, made necessary by the consolidation of the Western Union and Mutual Union companies, to represent the Telegraphic interests of the petitioners and others in Boston and vicinity. A similar petition has seldom gone forth from this city. Among its signers were representatives of the various sugar refineries, prominent and wealthy State street bankers and brokers, members of many of the larger firms in the woolen, dry goods, leather and other trades, city officials, the collector of this port, State officials, most of the newspaper proprietors and editors, telegraphic correspondents representing 20 or 30 New York and Western leading newspapers, members of the legal profession and various others, all of whom, from the date of the establishment of the Mutual Union office in this city, have been served by that company, and who take this method of expressing their confidence in Mr. Hern's ability and their wish that he be retained in a leading position by the Western Union management. The petitioners point to the foothold gained by the Mutual Union company in this city as the result of Mr. Hern's tireless efforts, and pay the superintendent a deserved compliment for his personal qualities and his executive ability. It is proper to add that the petition was originated and circulated without Mr. Hern's knowledge. But his friends were determined to place on record their esteem for the superintendent and their regret that the excellent service which he has given them is to be discontinued.—*Boston Herald.*

Cutting Telegraph Wires.

THE ACTION OF THE MAYOR OF CHICAGO UNLAWFUL AND ACTIONABLE.

Judge Drummond, of the United States Circuit Court, Chicago, has rendered his final decision in the case of the Mutual Union Telegraph Company. He emphasized his former opinion that the Mayor's action in cutting the wires was unlawful and actionable, but held that, as the Mutual Union rights had terminated under the charter, the Court could not order the wires repaired or prevent the city from carrying out the ordinance which prohibited the stringing of wires.

Underground Wires in Chicago.

John G. Moore, president of the Mutual Union Telegraph Company, said recently that the right of the company to enter Chicago, except by underground wires, expired on March 1, but he had supposed that no action would be taken by the city government before May 1, when all the telegraph companies would then be obliged to put their wires underground. The company had opened offices at the city limits, and the cutting of the wires had had no other effect than merely to deprive the city of the facilities offered by the company. Mr. Moore said in addition: "Unless the Western Union Company shall put its wires underground, it will be treated undoubtedly in the same way. In fact, I think that the cutting of our wires was really an attack on the Western Uunion Company. Of course, we have no particular interest in the matter because the Western Union, under the terms of the lease, assumed all our contracts about rights of way. The principal difficulty in the way of compliance with the Chicago ordinance has been the practical failure of all methods for the laying of underground wires. Science may yet provide a way for placing telegraph wires under ground, but thus far all plans have been unsuccessful. I suppose that the Western Union lines will be cut in the same way on May 1. The only result will be that Chicago will be virtually deprived of telegraphic communication with the rest of the world. People will be obliged to go four miles out of town in order to send telegraphic messages anywhere. The telegraph companies can endure this probably as long as Chicago can. If it wants to carry its messages four miles, I see no reason why it should not do so."

The Mutual District Messenger Company, Washington, D. C., is getting ready to open for business. From a canvass made of the territory, the promoters feel encouraged with the ultimate success of the scheme. The following are the officers and directors of the new company:

John Hancock, President; H. W. Pope, Vice-President; H. W. Gwinner, Secretary and Treasurer. Directors, H. W. Pope, Vice-President of the Manhattan District, New York; W. H. Woolverton, Treasurer of the Hoole Mfg. Company, New York; John Hancock, W. F. Allen, editor of the *National Railway Publishing Company;* C. H. Sewall, General Superintendent of the American District Telegraph Company; Henry W. Gwinner, President National Railway Company, and Mr. Riebenack, Assistant Comptroller of the Pennsylvnnia Railway.

The United Press has appointed Mr. Walter P. Phillips as its business manager, with headquarters at 135 Broadway. This is an excellent selection, and shows the sound judgment of the management of that association.

Mr. Geo. F. Milliken, for many years manager of the Western Union Telegraph Company at Boston, Mass., has lately established an agency for the sale and installation of the apparatus of the Fuller Electrical Company, having his headquarters at 37 Pearl street, Boston.

Mr. Lorin Blodgett has completed his revised census of the industries of Philadelphia, and gives a total of 11,482 establishments, employing 237,566 men, women and youths. The figures given by the United States Census of 1880 were 8,377 and 173,862 respectively. Mr. Blodgett is confident that Philadelphia occupies the first rank among American manufacturing cities.

A company is about being organized by Messrs. Packer, Fitzgerald and other prominent residents of Seabright, with $50,000 capital, for the lighting of this place with electricity. These new lights will not appear to the mariners on the coast like any of the well-known beacons and thereby misguide them, as has been feared, for it is intended to place them in a continuous line from Bellevue Hotel to Long Branch, a distance of four miles.

The officers of Engineers in Berlin are making interesting experiments in war balloons, and in photographing from a height sufficient to be out of range and command a view of the surrounding country, in spite of a rapid rise. By means of an electric apparatus a plate has been secured in less than a second.

Great Britain has, at present, 23 metallurgical works producing steel, with 115 converters, and a productive capacity of 1,460,000 tons per annum; Belgium has 4 steel works with 18 converters, and a productive capacity of 380,000 tons; Austria 14 works, 36 converters, 632,000 tons; Germany, 23 works, 80 converters, 1,300,000 tons; Russia, 5 works, 10 converters, 100,000 tons; Sweden, 35 converters, 80,000 tons; the United States, 34 converters, 1,500,000 tons. This applies to Bessemer steel. As regards the Thos. Gilchrist method, there was produced by it, in October last, in Germany, 25,170 tons of steel, from eight firms; in England, the works of Bolckow, Vaughan & Co., the only one using this process, produces 2,500 tons; Belgium produced 1,687 tons; Russia, 1,270 tons; France, 1,240 tons (the last have each, like England, only one steel works using the process). This gives a total, for October, of 46,537 tons of basic steel produced in 15 works.

The *Engineering and Mining Journal* states a self-evident proposition when it says that the Patent Office was never intended to be a money-making concern, and has no right to be one. It is absurd that more than four hundred thousand dollars should be added in one year to a fund which has reached the respectable sum of over two million dollars, when every employee of the office is so crowded with work as to cause hurried performance and unnecessary delays, and to give occasion for the litigation which is making patents such uncertain property. A reasonable employment of the annual surplus in the payment of salaries to an additional force will do much toward reforming existing evils. Last year, the Patent Office received 31,522 applications, and 20,518 patents were granted and certificates were issued.

There are now published in the United Kingdom, 1,962 newspapers, distributed as follows: England—London, 386; provinces, 1,144; total, 1,530; Wales, 75; Scotland, 184, Ireland, 152, and the Isles, 21. Of these there are 137 daily papers published in England, 4 in Wales, 22 in Scotland, 16 in Ireland, and 2 in the British Isles. In 1846 there were published in the United Kingdom 551 journals; of which 14 were issued daily—namely, 12 in England and 2 in Ireland; but in 1883 there are now established and circulated 1,962 papers, of which no fewer than 181 are issued daily. The magazines now in course of publication, including the quarterly reviews, number 1,311, of which 326 are of a religious character.

The Precious Metals.

The production of precious metals throughout the world during 1881 somewhat exceed that of the previous year. The production of gold in 1881 was of the value of $107,773,157 and of silver $97,659,460, whereas in 1880 the figures stood at $106,436,786 for gold and $94,451,060 for silver. By far the largest producer was America, viz.: gold, 34,700,000; silver, $43,000,000; followed in descending scale by Australia—gold, $31,127,515; silver, only $227,125. Russia—gold, $28,551,028; silver, $473,519. Mexico—gold, only $989,160; silver, $25,167,763. Columbia—gold, $4,000,000; silver, $1,000,000. Germany—gold, $232,610; silver, $5,576,699. Austria-Hungary—gold, $1,240,808; silver, $1,303,280. Venezuela—gold, $2,274,692; no silver. Africa—gold, $1,993,800. Canada—gold, $1,094,946, silver 68,205. Bolivia—gold, $72,345; silver, 11,000,000. Chili—gold, $128,869; silver, $5,081,747. Spain—silver, $3,096,220. The remaining supplies were furnished by Sweden, Norway, Italy, Turkey, the Argentine, Brazil, and Japan. The largest circulation of paper money throughout the world in 1881 belonged to the United States, which had $793,074,878 value. Next came Russia, $612,916,209; followed by France with $512,129,625; Austria, $299,091,135; Italy, $293,772,885; Germany, 211,122,464; Great Britain, $203,692,764; Brazil, $188,155,455. The smallest paper circulation was in Central America, which stood at only $163,347. The largest circulation of gold was in France, viz., $974,876,000 value; followed by Great Britain, $592,000,000; United States, $563,631,455; Germany, $387,143,742; Spain, $130,000,000; Italy, $144,750,000; Belgium, $103,000,000; Russia, $119,209,784. The smallest gold circulation was in Peru, which figured at the value of only $62,085.

The annual meeting of the stockholders of the Gore Underground Wire Co. was held on Monday, March 12th, at Room 15, 8th floor, in the Mills building. The following gentlemen were elected Trustees for the ensuing year: David Richmond, Frank W. Allen, George A. Scott, John W. Weed, Henry W. Pope and Charles L. Gore. Mr. George A. Scott was elected President; John W. Weed, Vice-President and Treasurer; and Charles L. Gore, Secretary and General Manager. We are informed by Mr. Gore that the company have now ready for laying a cable of over 3,000 feet, containing nine wires, which the company propose to lay for the purpose of practically demonstrating the Gore system, and for the purpose of experimenting upon. A permit has been obtained from the proper authorities for opening the streets, and as soon as the frost is out of the ground the company will immediately commence to lay the line. We shall watch with much interest the development of this system, as many leading experts have expressed themselves in its favor.

A New Copper-Zinc Alloy.

Mr. Alexander Dick, formerly one of the directors of the Phosphor-Bronze Company, has succeeded in producing a new copper-zinc alloy which exhibits characteristics as essentially superior to brass as those of bronze are to gun-metal. The advantages claimed for the new alloy, which has been named "delta metal," are great strength and toughness, and a capacity for being rolled, forged and drawn. It can be made as hard as mild steel, and when melted is very liquid, producing sound castings of close fine grain. The color can be varied from that of yellow brass to rich gun-metal; the surface takes a fine polish, and when exposed to the air tarnishes less than brass. These latter characteristics will meet with ready appreciation for cabinet work, harness fitting, etc. The metal when cast in sand has a breaking strain of 21 to 22 tons per square inch; when rolled or forged hot into rods, the breaking strain is 43 tons per square inch, and when drawn into wire of 22 B. W. G. of 67 tons per square inch. We give particulars of the tests of two rods, one as rolled and one annealed, made by Mr. Kirkaldy, showing the breaking strain to have been 33.6 and 27.2 tons, and the ultimate extension 8.8 and 17.5 per cent. There is a small case of this metal at stand No. 58 of the Sportsman's Exhibition at the Agricultural Hall, London.

A correspondent in the New York *Times* writes as follows from Bermuda:

"The telegraph line, like most other things hereabout, belongs to the Government and is operated by the military, being under charge of the Royal Engineers. There are about 40 miles of wire in use, with 11 offices. In Hamilton the telegraph office is in the Post-Office building, and there are always half a dozen soldiers to be seen lounging about it. The principal object of the line is to furnish ready means of communication between the Governor and the troops, but the public are kindly permitted to send messages over it for a consideration. If I were to go to the office and send a message to the other end of the island, they would charge me twelve cents for ten words. But anybody attached to the public service can send a twenty-word message for six cents. If, while my modest message was traveling over the wires, the Governor-General or the Admiral or any of the great highcockalorums should want to send a dispatch, my message would be stopped and theirs would take precedence. This is because the public safety requires that their dispatches shall go instantly. When the Admiral telegraphs the General that he will be over at Mount Langton to spend the evening, and to have the water hot and the sugar and lemons ready, it will not do for any paltry private dispatch to come in the way."

The telephone companies whose management centers at Lowell, Mass., made a net gain of subscribers for the month of February, as follows:

	Connected Feb. 1.	Gain Feb.	Total Mar. 1.
National Bell of Maine	3,699	40	3,739
Boston and Northern	2,822	117	2,939
Bay State	2,332	74	2,406
Union	256	4	260
Suburban	1,007	93	1,100
Granite State	411	3	414
Acquired by purchase of Northwestern		1,400	1,400
Net gain		1,731	
Grand total under Lowell management, March 1			12,258

The new postal law which goes into effect October 1st, 1883, reduces the rate on first class mail matter (letters) from three to two cents. Every half ounce or fraction thereof pays two cents. This will be an advantage to everybody who writes letters, and will effect considerable saving to business establishments.

The Western Union Building in New York is to be illuminated by the Edison electric light. The wires will be extended from the central station under John street across Broadway.

Business Notices.

The attention of persons interested in local telegraph and telephone organizations is respectfully called to the electric lighting system of The Fuller Electrical Company; and the practicability of making arrangements with that company for the introduction of its apparatus, either in isolated plants, or through the formation of local companies desiring to engage in the business of electric lighting. The specially valuable feature of this company's system may be seen by examination of its apparatus in Boston, Worcester, Providence, Hartford, New York City, Brooklyn, Jersey City, Paterson, Philadelphia, Lancaster, Scranton, Syracuse, Rochester, Buffalo, Pittsburgh, Wheeling, Steubenville, Xenia, Dayton, Grand Rapids, Chicago, Springfield, Belleville, St. Louis, St. Paul, and many other smaller places throughout the country. Correspondence is invited.

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NEW PATENTS—ELECTRICAL—1883.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING FEBRUARY 13d. 1883.

272,234 Automatic shunt for magneto-electric generators. Ezra T. Gilliland, Indianapolis, Ind.
272,017 Carbon electrode for electric lamps. James E. Atwood, Troy, N. Y.
272,256 Dynamo-electric machine. Edwin J. Houston, Philadelphia, Pa.
272,362-3-4 Device for regulating the electrical transmission of power. Edward Weston, Newark, N. J.
272,356 Dynamo-electric machine. Edwin Weston, Newark, N. J.
272,100 Electric clock. D. Fred. Sweet, Hastings, Mich.
272,125 Electric incandescent lamp. Philip Diehl, Elizabeth, N. J.
272,142-272,276 Electric railway signal. Wm. W. Le Grande, Louisville, Ky.
272,187 Electric gas generator. Charles E. Ball, Philadelphia, Pa.
272,262 Electric arc lamp. Nathaniel S. Keith, New York, N. Y.
272,329 Electric speaking telephone. Allen W. Rose and Charles A. Cheever, New York, N. Y.
272,353 Electro-magnetic retarding device. Elihu Thomson, New Britain, Conn.
272,358 Electric arc lamp. Edward Weston, Newark, N. J.
272,058 Galvanic battery. Theodore L. Kauffer and James Gerson, Boston, Mass.
272,069 Insulator for electric conductors. Theodore Mace, Plainfield, N. J.
272,365 System for the electric transmission of power. Edward Weston, Newark, N. J.
272,034 Telephone. Thomas A. Edison, Menlo Park, N. J.
272,210 Telegraphic relay. Thos. Cochran, Brooklyn, N. Y.
272,221 Underground conduit for electric wires. J. S. Du Bois, Camden, N. J.

WEEK ENDING FEB. 20, 1883.

272,505 Alarm signal apparatus for telephone exchanges. Edward A Woelk, Springfield, Mo.
272,441 Electric underground conductor. Rudolph M. Hunter, Philadelphia, Pa.
272,464 Electric railway signal. Edward L. Orcutt, Somerville, Mass.
272,724 Electric log or apparatus for ascertaining the speed of ships and the rate of currents. Robert M. Lowne, East End Finchley, County of Middlesex, England.
272,799 Electro-magnetic regulator. Richard H. Tucker, East Orange, N. J.
272,811 Electric arc light. Jean A. Wetmore, Concord, Mich.
272,839 Electric interlocking railway signal and switch system. John K. Knight, New York, and Wm. H. Baker, Brooklyn, N. Y.
272,659-0 Insulated electric conductor. Alfred A. Cowles, New York.
272,792 Metallic circuit for electrical currents. Samuel D. Strohm, Philadelphia, Pa.
272,645 Signaling apparatus for district and fire alarm telegraphs. Thomas A. Casey, New York, N. Y.
272,524 Telegraph wire coupling. Graham Brott, Waterford, N. Y.
272,774 Telegraph cable. Nicholas M. Rittenhouse, Baltimore, Md.
272,493 Voltaic battery. Julius M. Stebbins, New York, N. Y.

WEEK ENDING MARCH 6, 1883.

273,291 Apparatus for regulating the transmission of the electric force: Maurice Levy, Paris, France.
273,406 Air blast attachment for commutators of dynamo-electric machine: Elihu Thomson, New Britain, Conn.
273,359 Binding screw for electric wires; Ellery C. Coolidge, Boston, Mass.
273,429 Coupling for electrical conductors; Percy Ruskin Allen, Southwark, England.
273,336 Electric arc lamp; George D. Allen, Brooklyn, N. Y.
273,377 Electric railway signal: Chas. J. Means, Boston, Mass.
273,563 Electrical visual indicator; James U. Mackenzie, N. Y.
273,565 Electrical car brake; David J. Macpherson, Sioux Falls, Dak.
273,598 Electrode for secondary batteries; Wm. S. Platt, Waterbury, Conn.
273,634 Electric clock; D. Fred Sweet, Hastings, Mich.
273,484 Electrical railroad; Thomas A. Edison, Menlo Park, N. J.
273,490 Electro-magnetic railway system; Thos. A. Edison.
273,374 Fire and district telegraph: Thomas D. Lockwood, Malden, Mass.
273,366 Incandescing electric lamp; John S. Kelso, Stamford, Conn.
273,485-6 Incandescing electric lamp: Thomas A. Edison.
273,554 Incandescent electric lamp; Henry Lea, Birmingham, County of Warwick, England.
273,593 Insulated electrical conductor; William R. Patterson, Chicago, Ill.
273,643 Induction coil; George H. E. Trouvelot, Cambridge, Mass.
273,309 Magnetic ore separator; John Rae, New York, N. Y.
273,592 Method of filling telegraph cables with insulating substances. Wm. R. Patterson, Chicago, Ill.
273,329 Method of controlling the electrical transmission of power: Edward Weston, Newark, N. J.
273,487-8 Regulator for dynamo-electric machines; Thomas A. Edison.
273,491 Regulator for driving engines of electrical generators; Thomas A. Edison.
273,513-14 Railroad signal: William Hadden, Brooklyn, N. Y.
273,515-6-7 Railway signal apparatus: William Hadden, Brooklyn, N. Y.
273,558 Railway signal apparatus: Jos. P Livermore, Boston, Mass.
273,492 Secondary battery; Thomas A. Edison.
273,364 Telegraph sounder: William E. Davis, Jersey City, N. J.
273,489 Turntable for electric railways; Thomas A. Edison.
273,305 Underground conduit for electric wires; William Plankinton, Milwaukee, Wis.
273,493 Valve gear for electrical generator engines: Thomas A. Edison.
273,351 Watchman's time recorder; George N. Fillis, New York, N. Y.

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisements appear in this journal. In ordering please state the number and date of the patent desired.

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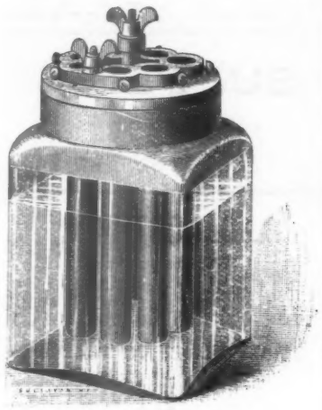

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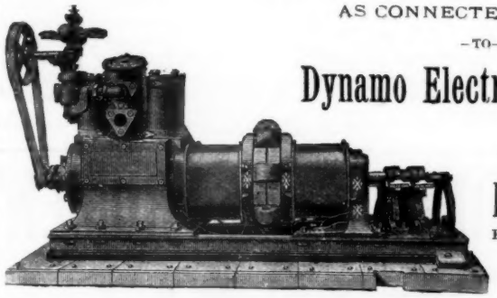

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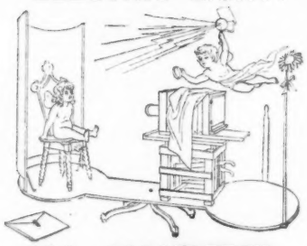

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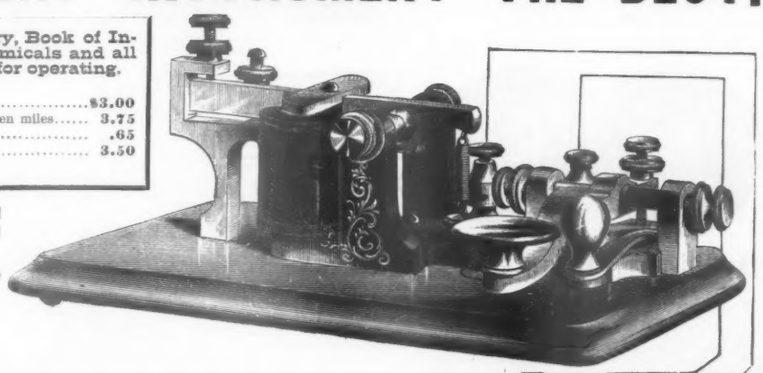

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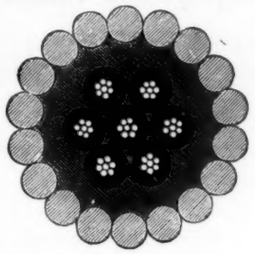

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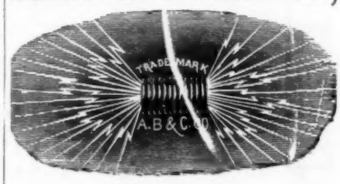

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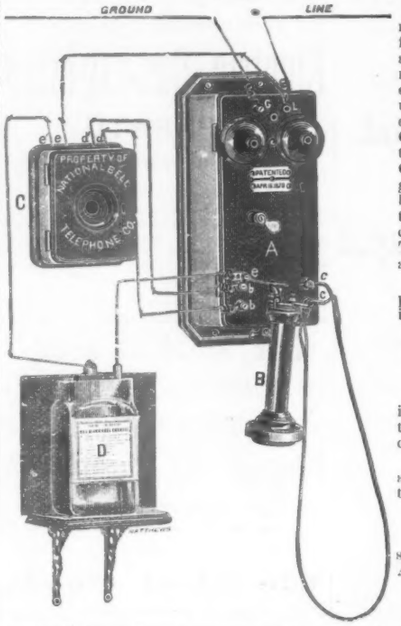

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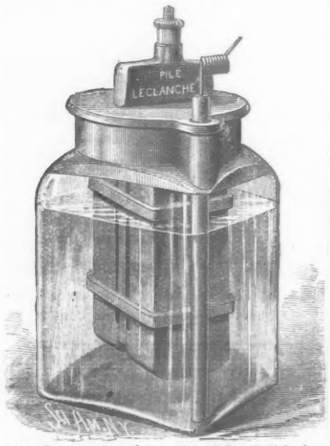

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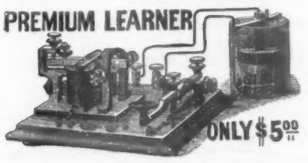

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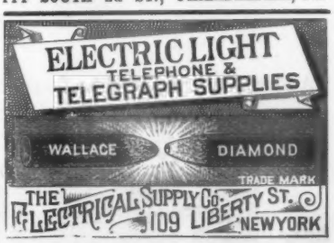
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